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Effects of Relativistic Motions in the Brain and Their Physiological Relevance

by **Mariela Szirko**

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Ontology of Consciousness

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Percipient Action

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"A rich tableau of research on the nature of consciousness … from archaic traditions in religion and culture to contemporary neuroscience to the testimony of personal experience." *—Alan M. Olson, Professor, Philosophy of Religion, Boston University*

Edited by Helmut Wautischer

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Review

This collection provides a rich tableau of research on the nature of consciousness by twenty internationally recognized scholars and researchers who draw on perspectives from archaic traditions in religion and culture tocontemporary neuroscience to the testimony of personal experience. Masterfully edited by Helmut Wautischer, Ontology of Consciousness answersquestions such as: what kind of being is the being to which we refer as consciousness? How long have humans been perplexed by the awareness of being? Are the questions of being and consciousness one and the same?

—Alan M. Olson, Professor, Philosophy of Religion, Boston University (*Endorsement*)

These percipient 20 essays are like detonating explosives, profoundly disturbing to various intellectual universes, and highly appropriate to be published by an institution famed for pushing frontiers in science and technology. They connect the dots between the seen and unseen worlds. They require Kierkegaardian leaps of faith. They stretch referential meaningin order to understand human powers of wordless communication that we share with other animals. The essayists have playfully created a new Metaphysical Club open to all with courage to explore.

—Wilton S. Dillon, Senior Scholar Emeritus, Smithsonian Institution (*Endorsement*)

One does not realize how painfully narrow is our dataset concerning 'conscious phenomena' until one works one's way through this book. The astounding spectrum of human beliefs about and experiences of consciousness is here carefully organized, analyzed, and categorized. Many chapters, even as they evoke skepticism, make for spellbinding reading. Ambitiously interdisciplinary, this text will be superb for classroom use and could signifi-

cantly influence the philosophy of mind—if this field is willing to expand the range of its data in the ways here suggested.

—Phillip Clayton, Ingraham Professor, Claremont School of Theology, and Author of Mind and Emergence: From Quantum to Consciousness (*Endorsement*)

An essential source book for the study of consciousness and foundations of experience. This book provides comprehensive analyses of diverse philosophical, religious, anthropological, and scientific approaches to human experience. Scholars who study consciousness, whether they be behavioral, social or biological scientists, or just educated readers, will find in this volume a store of data necessary for the pursuit of this subject.

—Douglass Price-Williams, Professor Emeritus, Departments of Psychiatry and Anthropology, University of California, Los Angeles (*Endorsement*)

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About the Editor

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Mariela Szirko is a neuropharmacologist with degrees in pharmacy and biochemistry who has also had a teaching career in neuroscience, philosophy, and psychology. She is head of the Neurophysiology Department at the Centre of Neurobiological Research, Ministry of Health of the Argentine Republic, Full Professor of Neurophysiology in the Department of Neuroscience, and researcher in charge of projects in the Laboratory of Electroneurobiological Research of the Neuropsychiatric Hospital J. T. Borda, Buenos Aires City Government. She has also worked in several CONICET (Argentinian Council of Scientific Investigations) research projects for the Laboratory of Sensory Research and the Physiology Department of the Pharmacy and Biochemistry Faculty, University of Buenos Aires, and is editor of the journal Electroneurobiology. The central focus of her work is investigating brain biophysics and neurochemical microprocesses in relativistic perspective.

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Since consciousness research is being constantly updated by all scientific fields, it becomes increasingly difficult to develop comprehensive theories that are inclusive of empirical data from diverse disciplines without excessive parsimony. As a given fact, if not by ontological necessity, conscious action manifests itself within boundary variables, regardless of how minute or transient such "eclosions" appear. The action of minds presents itself both locally and nonlocally, providing an electrifying tension that is described in this section. An admittedly bold, but at the same time beautiful, execution of empirical research in the neurosciences brings data for a grand synthesis presented in the two chapters that follow. A monistic theory that acommodates a dualistic interpretation appears to be an oxymoron, but succeds in transforming a palindrome from metaphor into fact.

In chapter 11, Mariela Szirko notes that cerebral biophysics is not an exception to established laws of physics applicable to all other occurrences of condensed matter: brains, too, include microphysical components in their tissue

that move at close to light-speed. The critical question, one often ignored, is if and how such motions bring about physiological effects and how this relates to psychological realms. Szirko describes the work of neuroscientists in Argentina, dating back to the eighteenth century, and how it has focused on ''electroneurobiology.'' This approach, which appears to have been especially suitable for revealing any such effects, is based on assuming the uncoupling pathologies that disconnect persons from their circumstances, sharing with sleep and the variations of inattention the common mechanism of changes in a physiological time dilation. This is a relativistic effect of motion from the tissue's microphysical components, and is physiologically operated through coupling with the electroneurobiological states of that tissue. Szirko argues that these findings are of value to neurobiologists, psychophysiologists, humanists working on brain-mind issues, as well as to scientists investigating biological dynamical systems, biophysics, mathematical biology, computer biology, and molecular biology. In chapter 12, Mario Crocco begins his chapter by observing that conventional wisdom holds that science cannot discover or describe any intrinsic, noninstrumental value. Research in a broader perspective, however, indicates that this may not be the case. Crocco casts a wide net to counter conventional wisdom, including ''astrophysical-biospheric evolution.'' This process has been functionalized and can be used as a means to afford responsibility to mind-possessing living creatures. In science's grand picture of reality, therefore, natural science's aspiration of ''naturalizing the minds' depiction'' does not clash with the humanities' recognition of intrinsic value in persons.

H. W.

11 Effects of Relativistic Motions in the Brain and Their Physiological Relevance

Mariela Szirko

Abstract

On scales small enough, cerebral biophysics is not an exception to established laws of physics applicable to all other occurrences of condensed matter: brains, too, include microphysical components in their tissue that move close to light speed. The critical question, if and how such motions bring about physiological effects and how this relates to psychological realms, has come to noteworthy results: extended research in our neurobiological tradition suggests an affirmative answer and also describes the formation of psychological features. Neurobiology in Argentina got underway in the second half of the eighteenth century and focused on electroneurobiology. That tradition has proved especially useful for revealing any such effects and, along with older results, more than three decades ago it developed a scientific view about brain-mind issues involved in recovery from fainting, comas, vegetative states, hibernation, general anesthesia, or ordinary sleep. This view assumes that the uncoupling pathologies that disconnect persons from their circumstances share with sleep and the various forms of inattention a common mechanism, namely, changes in a physiological time dilation, which is a relativistic effect of motions from the tissue's microphysical components, and is physiologically operated through coupling with the electroneurobiological states of that tissue. This explanatory model from neurobiology is also of special interest to physicists, since the coupling that operates such a mechanism instances a dynamical mass variation in some action carriers of a force field brought forth by way of overlapping variation in the intensity of another force field. Supported by clinical and neurobiological facts, research related to these findings has been made available in Argentina for many decades, but it has only recently come to the attention of the international scientific community. These research results are valuable for neurobiologists, psychophysiologists, and humanists working on brain-mind issues. Scientists investigating biological dynamical systems, biophysics, mathematical biology, computer biology, or molecular biology can also recognize these findings and their clinical applications as relevant data for comprehensive research in their area of specialization.

Preliminary Observations

This chapter examines neurobiological and clinical observations that may be considered direct—rather than biologically mediated—consequences coming from the

physical instant's ability to compound changes that generate the flow of time. Placing such observations in this context offers original results. The basis for the entire schema is the validity of special-relativity transformations even for the smallest time scale: it allows, for moving observers, dilatability both of intervals of any duration, even so brief that forces could not yet make a change in it, and also of the actual instant itself. Its interest is scientific, humanistic, and clinical. Supported by evidence expounded hereby, the range of validity for relativistic transformations (from long intervals down to the most fleeting possible one) also disproves the belief that the physical instant is interval-unlike, namely infinitesimal in the specific sense of being not integrable into intervals. These intervals resulting from the dilation of the instant—although they are time-resolvable or divisible and measurable by a clock at rest outside the observer—for an observer (*mind*) whose operative interactions are localized at microphysical components moving within the brain tissue with speeds close to light velocity remain unresolvable, as undivisible moduli of her time acuity.

This motion state, of the microphysical components at which the brain-mind interactions are localized, thus transforms a physical instant—which is a very minute period considered the ultimate modulus of transformational change, namely the minimal interval over which a causal transformation is at all possible or might be marked off by two different instants—into the minimal transformational resolution or time acuity of minds, which is observed to stay in the order of one-hundredth of a second. We do not live and remember physical instants; we live and remember moments, and the difference between an instant and a moment is a dilation that stretches physical instants an ascertainable number of times.

The particular number of times affords precious information about the entire process, and also about the role of the relativistic transframing as biological tool, employed for varying the time graining (minimal resolution) of experiences and recall and, as a byproduct, for varying their attentional features as well. Generally not connected with psychology, this transframing is a motion effect naturally expected in the current state of our physical science, except where it is disqualified by the belief that the physical instant is interval-unlike—a belief that I will briefly address here.

As is known in the history of ideas, even if not particularly discussed in this chapter, this empirically disproven belief that the physical instant is interval-unlike has arisen in disparate epochs and cultures—pre-Columbian American, Eastern, African, ancient and contemporary European contexts—that may be fairly unrelated but are similar in certain characteristics. One of these is a compelling interest in holding illusory the irreparable time elapsing. The assignation to the physical instant of the aforementioned infinitesimality, or inability to compose (or integrate) into the real time or non-interval-like character called the ''Chrysippus-Newton-Sommerfeld notion of instant,'' supplies the reasoning for a latent desire to find illusive the irrevocability of time. In other words, this antichronic or time-discounting belief in the interval-

unlikeness of the physical instant requires us to assign a lowest limit for the validity of the Lorentz-FitzGerald transforms, which are the basis of special relativity. Let me briefly explain this point. For durations that can be measured, one can empirically verify that a certain number of physical instants—that is, a sequence of possible causal transformations—must appear dilated if the total duration is assessed from the sequence recorder (a clock) of moving observers. The antichronic outlook entails assuming some impediment that stops this dilational effect for smaller numbers of physical instants. In its view short intervals ought not to get dilated, a ban applied to the single instant in particular.

The groundlessness in conjecturing this impediment becomes apparent when we consider that no force in the observable universe can cause a transformation in less than about 10^{-25} second (imagine 0.000 000 000 000 000 000 000 000 1 of a second), a duration that may also be expressed as its equivalent, namely as $\sim 10^{19}$ Planck instants. Every transformation in time is thus currently ticked on intervals always larger than this one. Such a brief interval is accidentally unmeasurable (because any recording change in a clock must be caused by some physical force, but no observed physical force could give rise to any effect so quickly). Nevertheless, nothing suggests that this $\sim 10^{-25}$ second interval or a fraction of it is intrinsically noncompliant with the Lorentz-FitzGerald transforms.

Put differently, nothing suggests that this $\sim 10^{-25}$ second interval or a fraction of it be refractory to become dilated and expand in due proportion any eventual marking sequence that subdivides it, revealing even the duration of those of its fractions (physical instants) in which no subdividing mark could ever be set—these fractions, if dilated, are to appear as a still discrete, causally impenetrable blank when appraised by moving observers. Where and why might any such hindrance to dilation be expected to begin, barring the special-relativity transforms' validity for fleeting intervals? The antichronic outlook demands this impediment in order to judge the physical instant unreal. In contrast, it is often thought that the Planck instant or Planck time $(\hbar G/c^5)^{1/2} = 5.3916\ldots \times 10^{-44}$ second, a minute fraction of a second (actually requiring forty-three zeros after the decimal point before starting with the stated numbers), may name a limit for any possible physical force to be efficient in causing a causal transformation. That is, it is thought that the Planck instant denotes the interval-like thickness of actuality, whose causal transformations—always taking many such instants because of the cosmologically acquired weakness of efficient forces—make real time. But this prospect is disturbing for an outlook that struggles against time. It rather wishes for a "block" universe where all intervals are simultaneously real, the actually present instant in no way different from the past and future ones, and time elapsing just subjective or illusory.

Historically, such yearning appears to be linked to the same societal stratification wherefrom the physicomathematical grounds of modern science emerged, fostering

the nonintervalic notion of instant. Scientific observations contradict this notion. They occur in the study of very complex systems, namely in neurobiology and its supporting clinical research, whose study belongs to a separate branch of learning and forces a scientist to depart from relativity physics. For this reason the context and observations presented in this chapter are rarely made available for physicists and biophysicists, notwithstanding their primary interest in features of, and hypotheses about, the physical instant. This chapter is written to remedy this situation.

Mind-brain research in Argentina stems from a 250-year neurobiological tradition that has focused on what today would be called the dynamic ''sculpting'' of intensities of the electric field inside brain tissue. This sculpting, not the connective function also served by the nervous ganglia integrated in the tissue, makes the dielectric states of electroneurobiological organs. The approach centered on these states differs from neuroscience research abroad, where the primary focus is on the circuitry embedded in the masses of brain tissue—a biochemically regulated circuitry whose activity carries out such dynamic ''sculpting.'' This electric field ''sculpting,'' in turn, molds the states of another physical field, on which minds also have a direct effect and react to it: the local states of this field, not those of the electric field, provide the cerebral localization of minds' operation—a topic discussed below. Our recognition of this force field in addition to the established ones had been portrayed abroad and even by esteemed local electroneurobiologists—quite consistent with nineteenth-century science—as if this field were a vital principle (vitalism). Our disambiguation of these concepts made clear that this portrayal was inadequate; it survived nonetheless as an added impediment to communicating our results across the contrasting neurobiological approaches (our emphasis on neurodielectrics versus emphasis on neural nets abroad). This chapter also aims to dispel this misperception by providing a synoptic overview.

Originally staged in private and university laboratories, our research programs moved to general hospitals in the 1880s, and by 1899 were mostly conducted in neuropsychiatric hospitals (see Triarhou and del Cerro 2006a, 2006b, 193–195). These beginnings bequeathed to the Argentinian mind-brain research a combination of natural-scientific and humanistic aspects, a blend inspired by the recognition of every mind's intrinsic value. There is also a cultural dimension to our research and outlook regarding minds, whose conceptual articulation has been consistently dubbed abroad the ''tango theory.'' Eventually we found it perceptive and, like the first propounders of the ''big bang theory,'' we got used to the label. In our research ''consciousness'' is not seen as a freely exchangeable material, replaceable in whole or in part for another portion of a similar nature—the nature of a ''fungible material,'' such as a physical field or a body of water divisible in homogeneous portions. Thus every mind is defined not as mere intellectual performance but rather as synonymous with a psyche or finite existentiality, and to stress this all-important point, in what follows, mind or psyche will be referred to as ''her,'' not as ''it.''

Every mind is found to be primarily an unconnected, and unmergeable, eclosion or ''pop-out'' of ''existential finitude.'' Although rare, the word *eclosion* will nevertheless appear often in this chapter. The phrase ''existential finitude'' denotes for natural scientists every reality able to sense and move a portion of nature while altering herself by sedimenting those causal involvements away from temporality—this refers to an ''instant'' and not a time sequence. The designation ''away from temporality'' thus means ''not on a time course but inside the instant,'' specifying where such reality occurs and simultaneizes the sedimented sequences (''memories'') of her reactions to her causal interactions. This is why any reality that knows itself ought to possess memory: since nature vacates itself outside actuality and consequently every thing in nature, including each mind, exists only within the physical instant, the preservation of memories is an effect due to the absence of time course rather than the presence of brain engrams.

By way of the brain organ, memories are made to include a representation of the time course that affected the surrounding circumstances. A most remarkable feature, each eclosion of existential finitude is found at a fixed circumstance (i.e., some brain, body, family, epoch) and possibilities of interpersonal relationships, wherefrom every circumstanced existentiality sensoperceptually apprehends reality as differently centered. This makes a well-defined or precisely determined sorting that, nonetheless, cannot be determined, by the boundary conditions or historical path that led to compose such circumstance and formed the brain in it, rather than another sorting, in which this existential finitude has not eclosed at all or instead ''popped out'' at a different circumstance. More simply, no brain can determine who will be the person to sense its states or to exert active ownership of it.

Consequently, the ontic makeup of minds or psyches is not to be confused with their mental contents. Mental contents are those distinctions, in the ontic makeup or constitution of minds or psyches, that only the incumbent individual mind can respectively know and distinguish, despite the fact that some of these mental contents can also be shaped by nonexclusive, fungible means. Such means are based on the action of physical force fields, used by every brain organ only to demarcate mental contents in any mind eclosed at it; no brain can specify which existential finitude is to interact with itself rather than with some other brain. This organic incapacity becomes undetectable when every mind is supposed to consist only of her mental contents—whose generative making is misjudged as the full entirety of brain-mind relationships. As a remedy to this oversight, the word *existentiality* also serves to designate a mind without special regard to the acquired contents this mind differentiates in her own reality or ontic consistency. This reality is ontic and also ontological—that is, also directly knowable to itself both with regard to its state and the causal generation of its inner contrasts and their demarcations, thus making those contents observable. These mental contents are the acquired availabilities found in everyone's mental world, and are made up of structural (structure-possessing) and structureless elements. Mental

contents' structureless element comes as the mind's reaction either to outer actions (intonation, phosphene-like phenomenology) or to the own acts (nonintonative or nonphenomenal reaction); mental contents' structure also comes from either extramentality or the mind—that is, as outer patterning of the sensation-generating causal actions or as combinations of the mind's sensation-generating own causal acts. Other availabilities are inherent or primary and thus are not called contents, but constituents of every existentiality.

In sum, all minds take advantage of availabilities that can be divided into five kinds: two inherent abilities, namely sensing and moving (which compose a ''cognoscible transformability,'' whereby a mind knows her state and every causally efficient change occurring in it); and three kinds of acquired things or mental contents (''differentiations'') that are possible to know and handle in the mind. Differentiations broadly overlap with what many authors call ''sensoperceptions,'' ''episodic memories,'' and ''praxias.'' These three kinds of mental contents are known and handled only by the incumbent finite subjective existence, namely by the existentiality of whose ontic consistency they are disjunctive alterations. Only one of these three kinds is regularly affected by causal actions emanating from its surroundings.

Sensoperceptions—comprised of sensations and perceptions—are the availabilities that the causal series coming from the surroundings may also directly affect. Inasmuch as such sensoperceptual mental contents are demarcated by fungible means, their study—viewed as the whole of psychology where minds are believed to consist only in the so demarcated mental contents—becomes a natural science, namely a subdivision of neurobiology. The other two kinds of mental contents, episodic memories and praxias, cannot be affected in this way. Further, both of them are nonsensorial insofar as they involve nonphenomenal actions of the mind in extramentality. These actions may in turn causally feed into the mind fresh sensoperceptions that are hence traceable by scientific methodologies canvassing the productions of fungible means.

Minds, therefore, do not become innerly differentiated into mind's acts and mind's ''objects'' for contemplation, in the vein of languages that presuppose having to deal with what is signified by verbs and by nouns, or Platonisms that distribute reality into changing transiences and permanent realities. Objects are particular combinations of efficient causal actions. Also mental ''objects,'' or rather contents that can be made sensoperceptual, are mind's acts or causal actions, combined into diverse structures (attentional motor patterns, which may or may not trigger neural motor patterns), plus their possible structureless intonation as mind's reactions to one's own acts or to outer actions; these outer actions may also pattern the reactive origination of intonations that they induce, thus bringing onto sensations a structural component coming from outside—yielding patterned sensations. Leaving these fresh sensations aside, all the remaining, older mental ''objects'' (episodic memories and learned praxias), being

available combinations of mind's acts, may be cognoscibly identified and referred to, no matter if barely unfolded, inchoatively, or if further unpacked into diverse degrees of completion. Furthermore, the mind, at her exercise of these particular combinations of her acts lending completion to her mental ''objects,'' may become intonated, whether in full sensation or in some measure of it (noergy, explained below); and the enacted combinations of mind's acts or mental ''objects'' may either work only on one's own mind, or also on the body, or even beyond it—in the surroundings. While episodic memories work on the brain that the mind reacts to, praxias work through this brain beyond it, into the surroundings that the mind monitors. Thus, episodic memories are nonsensorial but sensorially imaginable availabilities apt to be reconstructed in imagined sensoperceptions—that is, sensed as the mind's reactions to brain states that she generates—as located in one's biography and recognized as one's own. Praxias, in turn, are practical sequences of one's actions unpacking a distinct mental content, which in this way is reconstructable in behavior outside the brain. In this behavioral reconstruction of a distinct mental content, praxias join sensoperceptions and reimagined episodic memories to become subjects for study by the subdivision of neurobiology that studies the mental contents demarcated by fungible or replaceable means. From another point of view, episodic memories do not significantly differ from praxias as regards the unpacking itself, a topic explained below.

The other two kinds of availabilities, namely the inherent abilities (sensing and moving), are not acquired mental contents, but constitutional or primary abilities of every mind. One is gnoseological apprehension or knowledgeability: the ability to experience or have knowledge of one's own constitutive reality or ontic consistency, even if only of one's causal changes, and thus of differentiating the demarcations acquired by one's existentiality through causal efficiency whether of the outer circumstances or of the mind. The other is semovience, the inherent or primary ability of every mind found in nature (i.e., every circumstanced psyche or existential finitude compounding in a personal organism) to start new causal series and not merely continuing causal sequences that are transmitted from elsewhere.

In this context, the states of the brain organ to which a finite existentiality finds herself circumstanced only affect the new formation of mental contents of the first kind of differentiations (i.e., sensoperceptions), including sensoperceptions of the new brain states that the mind laid down for voluntary recall. These availabilities are the only ones shaped by fungible, or in other words, replaceable, means. These brain states are thus central to describing what is restored on recovery from fainting, comas, vegetative states, hibernation, general anesthesia, or ordinary sleep.

Brain states carry out this shaping in compliance with both causal-series-starting semovience of the finite existentiality that is circumstanced precisely to this brain organ (not of any other finite mind, or existentiality circumstanced anywhere else—

for example, one cannot directly move another's body, shape or watch another's dreams, see phosphenes by electrostimulating the brain of someone else, or use not one's own but another's brain to recall one's memories), as well as causal-series-continuing causation that is at work extramentally (that is, independently of being known by any circumstanced mind) and whose lawfulness, or nomicity, comes from this continuance. Even though this brain is the site, or tópos, where the incumbent mind is circumstanced for causal exchanges with the surroundings, as already mentioned no brain could determine who will be the person to sense its states or to exert active ownership of them. So, what exactly becomes restored on recovering the brain support of mental functions?

Brain functioning, by analogy, is vaguely reminiscent of regulating the proper speed in playing a soundtrack while simultaneously recording the music—the recording may or may not keep pace with its playing, ''hitching up'' or ''unhitching'' the music's source. Likewise, every brain organ, in its constituents that are immediately knowable and affectable by the mind (or psyche) circumstanced to it, can only lose or recover its aptitude (which is electroneurobiologically mediated) to provide adequate time resolution for the recording (a surroundings-depicting activity that is another electroneurobiological function of the same brain) of such forthcoming events of which a notice, knowledge, or gnoseological grasp has acquired evolutionary relevance, inasmuch as assigning it is conducive to nourishment or reproduction. Thus, the first aptitude or function gates the proper time resolution of the physiological hand-overs (which are the second function's products, and not immediately knowable themselves) that come from the sense organs and depict relevant events.

Contrary to this second function (surroundings-depicting brain activity) and in order to adjust the time resolution of the second function's products, the first function (gating) makes use of relativistic time-dilation effects that demand the coupling of a physical field's action carriers by another field. Just as two parties are needed for the tango, gating sensoperceptions also requires two distinct fungible physical fields, both overlapping and interacting yet diverse and segregated. No single field alone suffices. Application of these relativistic time-dilation effects is the core of the interaction of top-down corticocortical influences with bottom-up sensory entries. The gating function, far from ''losing consciousness,'' instead enacts the modifications in selective disattention and at its peak values ''switches off'' and ''on'' the body, as explained below.

Synopsis of the Major Themes

Any comprehensive theory about the minds or psyches found in nature needs to account for basic issues, including those in the following twenty questions and answers. The answers draw on the concepts of our tradition and will be discussed in more detail

later in the chapter. The present synoptic exposition is very compact and some specialized concepts are introduced fairly pithily, simply to introduce a previously unfamiliar neurobiological picture.

What are minds? The realities transforming in time based on a selection of their antecedents rather than all of them.

What precisely is it that minds do? A semovient refocusing of attention. When this refocusing is causally linked with the body, voluntary behavior occurs.

Where are the actions of minds localized in nature? In the force carriers of a physical field, whence minds can start behavior and sensorily react to changes in these force carriers.

In what kind of physical building blocks do minds find their most immediate localization? In the physical force carriers whose characteristics generate the observed relativistic dilations of interval units, or time ''graining.''

Can brain changes erase episodic and praxical memories, regardless of their time ''graining'' or patterning interval units? No, because things with memory (minds) and anything else in nature co-occur in time but for one single instant. Because within such instantaneous co-occurrence no causal transformation (time) elapses, and time changes macroscopic situations because of certain physical circumstances (connected with the acquisition of inertial mass) that are not known to take place in the minds, no thing with knowledge of its inner differentiations (memories) may lose their availability as a result of a causal transformation (time) obliterating or erasing them.

By what means do sleep, fainting, comas, and similar states disconnect minds from their surroundings? By varying the mind's time resolution of the brain's neurodynamical sequences. The brain generates this disconnecting variation by altering the relativistic dilations created by the speed of the force carriers where minds find their most immediate extramental localization.

For what reason are dreamt sensations perceived while simultaneous sensations coming from the sense organs are not perceived? Because the first ones are patterned with the resolution of extramental time sequences of a dreaming mind, while the second ones remain patterned with the resolution of extramental time employed to keep track of the outer processes of biological relevance.

How do perceived features fade due to inattention? By altering the relativistic dilations created by the speed of those force carriers in the brain areas that are generating features of which the mind is to become inattentive.

How are voluntary movements attentionally determined? By attentional refocusing that alters the density of force carriers—of the physical field where one's existentiality finds

its most immediate extramental localization; all force fields redistribute their potentials by way of altering the local density of its carriers—in the brain areas causally linked to one's selected organs.

Once they have been recalled and given attention to, where do memories again fade into? When no longer reimagined (i.e., no longer replicated in imagination) and also while their reimagining was neurophysiologically enacted, memories remain as operational combinations differentiated in the mind's ontic consistency, and as such are constitutive segments of it.

How does inattention cause amnesia? By texturing the mind's ontic consistency with contents whose time ''graining'' is not resolvable in the time resolution of the mind's available operational combinations that conserve the object.

When is neuroactivity nonconscious? When the time sequence of its (electromagnetic) patterns is not also conserved in the dynamics of the (other, nonelectromagnetic) physical field in whose force carriers minds find their most immediate localization.

How are memories semoviently recalled and recognized as one's own? By semoviently combining equilibrable operations, until arriving to focus attention on the same possibility of combining equilibrable operations that one had during an originally lived episode. Inasmuch as this recalling operation is defined by one's constitutive operatory possibilities that make its elements recognizable or understandable for oneself, it may be replicated in imagination any number of times.

Why is sleeping right after learning better for retention than remaining awake? Because the organization of memories reflects the time resolution in which the original experiences were lived: every time resolution allows reimagining the experiences from different time resolutions, but just as unattended context. Thus, sleep prevents the ensuing waking life from intervening, and sleep mentation—physiologically supported on a different time resolution—does not itself interfere, thereby providing a protection of studied content that is unavailable for contents learned without sleep interlude.

What is imparted when one pays attention to something? The operationalizing of its sensations. Thereby one applies to a sector of one's sensory field the acquired system of equilibrable operations sedimented in one's ontic-ontological consistency.

Does the overlap of time resolutions automatically generate recall? No, the effect of time acuity on memory is not direct. It affects recall only inasmuch as the proper matching of the time acuities—those of the original acquisition and its current knowledge—allows applying the system of equilibrable operations included at recall time in the mind's ontological consistency. Such application can be forestalled by other circumstances—for example, if the original acquisition occurred before the system of equilibrable operations is developed (infantile amnesia).

What is voluntary recall? Voluntary recall, also called conative recall, is the semovient act of retrieving a particular memory originally acquired at a previous time. On gnoseologically recognizing its operational structure, the intended memory is reimagined by setting up, most likely with intervention of the frontal lobes, a dynamic electroneurobiological state whose tuning normally involves different brain structures than these lobes. This electroneurobiological state first is to match the time acuity with which the memory was originally experienced; then second generate, in the circumstanced mind and through coupling with the physical field where all circumstanced minds find their immediate localization, sensory reactions (intonations, phosphenelike phenomenology) structured to match the particular memory as it was previously identified in her ''visio generalis'' (when selecting it for recall); and third, is then semoviently used to modify the reimagination process upon operative equilibria that conserve the particular memory as object of these modifications, thus recognizable through them.

What is gnoseological apprehension? Gnoseological apprehension in general—that is, any act of knowing or noetic act independently of who the performing mind is—is the feature of efficiently causal interactions whereby the enacted structureless reactions intonate the reacting entity on ranges whose manifestation exhausts these interactions' causal efficiency.

Assuming a plausible understanding of causation, how can privately accessible mental events cause or be caused by nonprivately accessible physical events? Because efficient causation for and across mental and physical events is the very same. The mind-brain causally efficient interaction is not more perplexing than the field generation of variations in local potentials. To set in motion a course of regular extramental effects usually called ''voluntary behavior,'' minds establish, as initial causal link, the local potentials of the nonelectromagnetic field whose carriers are utilized to start extramental actions. In so launching this causal series, every circunstanced mind does the same that all segregated fields do when, from an unlocalizable set of determinations, they make themselves either ''pop out'' more or less of their force carriers at every spot of volume, thereby changing the spatial distribution of their potential. In turn, on the same efficient causality, in setting up sensations this immediate field generates intonative reactions in the circumstanced mind. The actual problem does not consist in the interactions, but in why a mind ecloses to sense and move her brain rather than another.

What is restored on recovery from ordinary sleep, hibernation, general anesthesia, ''absence,'' fainting, comas, or vegetative states? While the preservation of memories is an effect of the absence of time course, their modifiable reimagining is an effect that exploits the presence of brain structures (utilized to ''flesh'' memories with new sensory intonations). For clinical practice, this means that the issue of ''impaired consciousness'' amounts to controlling the tissue's electroneurobiological activity that gates the proper

acuity and thus restores the time-resolutive matching. This allows for ''coupling'' or ''switching on'' the body in order to ''awaken'' the finite mind who had eclosed there.

Summary Exposition of These Major Themes

Let me expand this score of points that condense the basic themes.

What are Minds?

Past and future situations only arise in the context of minds. They do not exist outside of psyches: extramentally—that is, outside of minds—only present situations occur, not past and future ones. Past and future situations are only imagined, in a simplified way and diversely for sure. In this way—namely, by their being imagined now—their reality or ontic consistency is in fact a part of the present situation; in this it exhausts itself. In other words, past and future situations lack any other relevance for extramental reality, since they are neither found, nor do they cause effects, except as assemblages of mental contents envisaged by minds. Thus, all nature is actual only at a given instant, and each present situation determines its own time transformation; nonexistent situations cannot causally determine any transformation whatsoever. In this context, a cornerstone of familiar-scale physics is that, because aside from quantum concerns any indeterminacy in it is found to apply to future events, when determining each next transformation the actual or last situation is tantamount to its entire preceding history. In contrast, minds change quite differently: minds, existentialities, or psyches are the realities that transform themselves only on a selection of their respective antecedents, not necessarily on all of them. This is the objective definition of minds in general, as it is accepted in the Argentine neurobiological tradition. In contrast, the things situated amid finite minds (or things that compound the hylozoic hiatus, namely all extramentalities such as winds, rocks, fungi, trees, and computers, for which a variation in quantity or distribution of motion cannot occur as an effect of internal forces) inevitably use all of their history, tantamount to the last situation, to transform themselves as time elapses. Thus while all their yesterdays pack into their now, all our tomorrows are ours to shape. In finding the brute fact of this selection, physics finds in nature the gnoseological apprehension and semovience enacting it. Both are found to come conjointly, in discrete circumstanced eclosions, whose efficient actions and reactions become set as the natural phenomena we as natural scientists are trying to describe and understand.

Knowledge or gnoseological apprehension grasps certain phenomenal reactions, namely intonations of the self-knowing being, which cause to discontinue the outer causal series that had led to them. Such a series of efficient causal determinations comes to an end by producing intonative reactions—that is, phosphenelike manifestations that are both phenomenal (that is, in which a sensation is known) and inefficient

to continue the series. Therefore, the emplacement of circumstanced existentialities in nature is found whenever a break affects some efficient causal chain. The last link of this chain phenomenizes as the reaction of a self-knowing being, a reaction that becomes gnoseologically apprehended but lacks causal efficiency to further its preceding causal series. One aptitude excludes the other, both being discrete capabilities featured by efficient causation. As empirically found, outer causal efficiency can work out intonative reactions in psychisms, but it cannot cause psychisms to be affected in such a way as to instrumentally transmit the outer efficiency. Minds do not behave as billiard balls. Any causal consequence from this outer efficiency is thus to be a new causal string semoviently originated by the causal efficiency of the same self-knowing being that did the gnoseological apprehension, and selected it as causal antecedent rather than deselecting it, or else adjusted it contextually to posit it as causal antecedent. Such events do not happen in the hylozoic hiatus, where all of the causal series continue (i.e., all causal efficiency is transeunt, matter-energy is conserved over effects) but, in trade, there is no gnoseological apprehension. In other words, by coming to gnoseological apprehension, the causal series that led toward the intonative reaction cannot continue any longer; a semovient enactment of the efficient causality of the same self-knowing reality is now needed to start another causal series, which may enact continuity with or departure from the route of the former causal series.

What Precisely Is It that Minds Do?

Classical—not quantum—physics, accordingly, finds minds to be those realities that affirm, for their own transformation in time, a selection of nonexistent (past and future) situations. The finding occurs in view of the fact that noticing these nonexistent situations, a noticing that is gnoseological apprehension, is a prerequisite for such a selection. The affirmation of a selection is ''semovient,'' a term so far barely outlined. It means that such affirmation starts *a novo*, or from scratch, new causal series that transform the ontic makeup or consistency of the selecting and affirming mind, thereby also transformatively affecting and changing its causally linked extramentalities—that is, brain, body (or a neuroprosthesis, discussed below), and some of its surroundings. Because of that semovience, minds active at a break in efficient causal chains have been evolutionarily selected as a means to achieve determinations in mechanically undecidable situations. Nevertheless, this singularity (namely, the inauguration of new causal series of events instead of merely continuing older series, as mindless things do) is not relevant for attempting to localize in brains the actions of finite minds.

Where are the Actions of Minds Localized in Nature?

Semovient action is causally as efficacious in nature as the nomic or regular actions of mindless entities, such as rocks and chemicals, that continue transformative series instead of inaugurating them. In the physical sciences' description of the universe, a

basic piece of information is that all efficaciously transforming causal agents in nature (Newton's ''forces'') are localized at what behaves as some species of discrete force carriers, sometimes called ''force vectors.'' Force carriers appear as microscopic packets of force that propagate their causal efficacy with some inherent characteristics. Therefore, the organic localization of the actions of minds (not their ontic consistency but their local causal exchange with extramentality, or operative presence) can be pinpointed as the carrier particles that classical physics finds as the Newtonian force inflecting, or curving, the shortest path of biospheric evolution. Such a force does this—that is, affects the natural scenery on Earth, through the implementation of sensuality, including, for example, the lengthening of trophic chains through animal nutrition and reproduction under environmental demands undefinable for behavioral preprogramming, and the countless human endeavors whose effects on the biosphere are called ''anthropogenic perturbations.'' Among the latter's instances, not seldom ugly, one might rather recall that flowers coevolve by meeting sensual preferences, of which of late the human ones became important. In conclusion: working as a force, the action of minds is localized in nature in a certain kind of force carrier.

In What Kind of Physical Building Blocks Do Minds Find Their most Immediate Localization?

Like all other force carriers, the mind-exchanges-localizing ''particles'' are to possess specific speed-determining features. A key one is bulkiness. Without a small inertial mass, each force carrier would be forced to move at exactly light speed, being completely unable to vary its rapidity. Bulkiness limits the force carriers' speed and makes it different from *c*. Speed is crucial, because the magnitude taken by the speed of these ''particles'' expands relativistically (that is, spreads according to relativity physics) the ''thickness'' of the physical instant—the interval-like span ''during'' which all causation ought to stay nontransformative—into the time resolution or acuity of the individual gnoseological apprehension whose causal exchanges are localized in such quickly propagating ''particles'' or action packets. In other words, a minimal extramental interval unit (or ''instant'') is, in this way, dilated into a minimal experienced interval unit (or ''moment''). This relativistic dilation, technically expressed by the Lorentz-FitzGerald and the Valatin-Bogoljubov transforms, delivers across different motion frames the features of a unique causal efficiency.

Such a dilation is observed to be $\sim 10^{41}$ times, a magnitude specified by the velocity of these particles. (Of course, in case the modulus of transformational change is taken to be different from that of the Planck instant—for example, taking as ''primitive'' the transition time of some modality of interaction, all of which modalities in the currently observable universe take more than $\sim 10^{19}$ Planck instants—this specification of absolute speeds for achieving the proper time dilations will proportionally vary: a dilation of about 10^{20} times would suffice. The scenario, and the physical means at play

subsist anyway, and so to avoid needless complications, this chapter will provisionally assume the Planck instant as modulus of transformational change.) This speed, slightly less than light's, is determined by the very small inertial mass or invariant bulkiness of these particles, which makes them slower than light, and the dynamical mass-modulating, coupling effect of the overlapping electromagnetic field, whose potentials are diversely modulated by the physiological state in the diverse brain regions and, correspondingly, modulate the speed of these particles where the observer's interactions are localized. To be precise, the velocity that creates this dilation corresponds to subtracting from light speed an extremely tiny fraction, only about $1/10^{82}$ of light speed; I will use from now on the standard notation, indicating that it subtracts from light speed a 10^{-82} fraction. This speed may be further changed—by coupling with an even less efficiently coupled mode of electroneurobiological operation over considerable regions of the brain tissue—into a new velocity that only subtracts a 10^{-96} fraction from light speed and so turns the observer's acuity into a time resolution unable to resolve less than dozens of minutes. It is a much coarser time resolution or time acuity (sometimes called ''time graining'') than the one with which the formations offered by the brain organ keep track of the transformations of surrounding relevancies to ''read'' the environment in a biologically useful ''tempo.''

By analogy, such a condition resembles playing a musical recording at a speed many thousand times slower than the proper rate—stretching any musicality beyond recognition, forfeiting any ability to resolve (identify) single sounds or recognize the musical performance. However, the observer's ''local'' acuity stays unaltered and, whenever such an observer is awakened from any sleep stage (whether dreaming or not), she breaks off some course of mentation that ''at the precise time'' was entertaining. Between the two subtracted values, respectively proper to deep sleep and to wakefulness, a full range of attention-disattention is established, and each degree set in it may affect all or instead some of the brain's sensable productions.

Can Brain Changes Erase Episodic and Praxical Memories, Regardless of Their Time ''Graining'' or Patterning Interval Units?

No, because no brain engraving of them exists. Just as impetus is superfluous in keeping unperturbed bodies in rectilinear motion, engraving such memories in the brain is superfluous in keeping them in mind. Since nature is actual only one physical instant at a time, only the changed realities are actual in nature and the very antecedent making of all extramental changes is completely lost extramentally—that is, the past no longer exists. This follows from the discreteness of physically efficient changes (Planck's observation) and from their setting time on macroscopic scales. Thus, from the above definition of mind, it follows that the changes inside minds (i.e., sensoperceptions as well as episodic and praxical memories) lack a further, causally efficient multi-instant course structure that could make its former states vanish; it cannot occur

inside the single-instant actuality of the mind's changes causal efficiently achieved. Thus they ''remain'' available and make the three sorts of acquired availabilities.

Closer to an adage, our tradition states that memories cannot succumb to time: the simultaneous availability of the full autobiographical sequence is to be expected in the sheer availing self-knowledge of one's ontic reality. Circumstanced existentialities are not limited to occupying processes in sequential time, such as operating machines are—although minds' biological function is concerned with those processes, which are located solely beyond minds. In still other words, every thing that knows of itself (mind) cannot lose its sequences of changes as inner differentiations of its ontic consistency (which thus become ''acquired availabilities''), because minds do not exist in more than one instant and their causal efficiency does not establish (by way of action discreteness, exhausting efficient action in its doing causal change) another time inside them. Observers' ontology can become differentiated into containing calendars, but not into containing causally real intervals.

Minds exist only as present, in the same way as on time-transformation courses the whole nature exists a single physical instant at a time (*singuli*): thus extramentalities neither keep time-transformation courses in their present actuality, nor do minds keep time-transformation courses inside the single instant in which their ontology gnoseologically apprehends themselves. For this reason a mind's diversifications—or ontic differentiations or mental contents, which introduce inner variety in her reality—as acquired availabilities can be variably paid heed by her own semovient-gnoseological reality, but cannot be obliterated by action of extramental means. Another extramental time would be intramentally needed in order to achieve it, so that time could ''perish in time and the now in other now,'' to draw on the sixth-century wording of Damascius.

In such circumstances, just as Newton's formulation of the *laws* of motion in Euclidean geometry builds on his recognition that the ''natural'' motion or prosecution of unperturbed movements is rectilinear, so that a body left to its state of translative motion continues moving in a straight line rather than slowing down and coming to a halt or pursuing a curved or circular path, our tradition builds on a similar recognition. We take into account that the natural fate of the differentiations (memories), in those realities that know themselves while existing inside the instant, is the conservation of all of these differentiations—rather than these memories becoming ''erased,'' affected by a time elapsing (''time'') that occurs where they do not exist (since the observer's differentiations exist outside the course of transformations, a course whose existence in the relevant scale depends on certain early cosmological events, namely the acquisition of inertial mass by certain species of ''particles'' but not all of them) or pursuing any oblivion process path. There is no time within time. It is the ''inside instant'' feature of such ontic-gnoseological realities, the observers' minds, that turns superfluous

all extramental engraving or scriptlike recording of memories, just as impetus is also superfluous in keeping unperturbed bodies in rectilinear motion.

The ''inside instant'' existence of sentient agencies also thrusts itself into attention as the foremost characteristic of the subjective phenomenology of time. This characteristic is that time does not elapse for the experiencer—*el alma nunca pierde su lozanía*, i.e., the fact observable at any age that one's existentiality never loses her freshness—whereas time does manifestly elapse, instead, for one's novel experiences, whose presentation is inescapably sequential, as well as for the perceivable extramental things, such as one's aging body. Remarkably, though, such a conspicuous phenomenological trait of existentialities remains neglected by phenomenologists and by all the researchers that take the mental contents for psyches. The neglect might nevertheless have been instigated by culture, for example by the bracketing of diachronies in the yearning for a ''block'' universe, or by making it difficult in old age to distinguish between the deterioration of some kinds of performance and the integrity of one's unacquired or primary constituents; to stress the latter is as unusual as it would be trite to remark that outer behavior, imagination, and reimagination are affected by brain pathology. On the other hand, although memories cannot be erased because of not being retained in time transformability, they may, however, just fail to be understood in terms of some operative scheme of semovient operations—and thus fail to be reimagined by inchoatively reenacting such schemes, even while the brain organ works flawlessly. This makes for an important variety of oblivion, of psychogenic nature. Its basis is related to the very means whereby first disattention, then sleep, and then other ''losses of consciousness'' disconnect minds more and more from their surroundings.

By What Means Do Sleep, Fainting, Comas, and Similar States Disconnect Minds from Their Surroundings?

By now it should be clear that minds act in nature: all action in nature comes in packets, the packets of some species have a certain inertial mass that turns their speed slower than c, their coupling with the variable intensities of a surrounding field makes effective certain speed changes—tenuously similar to what a variably refractive medium does to the effective value of the speed of light—and, so, minds localizing on them their interactions obtain a peculiar time-condensed view of the events in which they causally participate. As a brain reduces its braking on those causal carriers where the action of the mind that senses and acts through such a brain inserts itself in extramentalities, the braking reduction speeds up the traveling localization (namely, such carriers) of the mind's exchanges with extramentality. Pursuing the optical analogy, one might imagine a reduction in the medium's refractive index. If of sufficient intensity, this reduction, shifting from one system of constraints to another the force carriers that provide a mind's immediate circumstance, puts to sleep the mind

circumstanced at this brain: in the new state of motion, she will no longer be able to resolve the brain's surroundings-depicting activity. The brain itself, of course, does not stop its electroneurobiological depictional activity during sleep, but this physiological activity (all of it carried out in the electromagnetic modality of interaction—that is, by exchanging the species of force carriers called photons) is not directly knowable by the mind circumstanced therein. Or, in other words, this process ''switches off'' the awareness of the body, by putting the sequences of brain activities out of resolutive reach of the circumstanced psyche. Her actions, too, become mismatched with brain-mediated behavioral articulations, a matter discussed below.

The ''switching off'' may come to the sequences of the activities of some brain portion, since sleep may not affect at once an entire brain but only half of it, or a sizable region, as occurs in many reptiles, almost all birds, and a number of mammals. This is why human snorers, who do sleep with the entire brain, cannot hear themselves snore—though a mother might reattune the time resolution of her sensory input, or ''awaken,'' at her baby's slight uneasiness, because of neural reactions (probably involving limbic activation of the startle response) that stir a reincrease in the field-mediated braking. The same means is at play whenever electroneurodynamic activities become impaired and fail to provide alert time acuity, failing (''loss of consciousness,'' fainting spell) to keep time acuity sufficiently fine-grained as to resolve their imitative outlining of the biologically relevant sequences of events.

For What Reason Are Dreamt Sensations Perceived While Simultaneous Sensations Coming from the Sense Organs Are Not Perceived?

The converse, namely mind's causal action in extramentality, thus also occurs across different relativistic reference frames (''is also transframed''). As mentioned, the healthy brain is always ''on'' and sensory neuroactivity does not cease with sleep. This fact is routinely verified in laboratories and also in the very remarkable, revealing convenience of closing eyelids to sleep, even of tucking the head beneath a wing to nap—as birds do. It is a key fact. This convenience would not arise if neuroactivity would stop, or if, as certain accounts put it, some ''curtain'' firing of thalamic and cortical cells occluded the transmission of sensory information through the thalamus and cortex, sustaining sleep by innerly clogging up the inflow of sense data: that is, by already doing the job of a sort of ''neurodynamic palpebra'' or ''intracerebral eyelids.'' Nor, in those scenarios, would inattention be a step toward sleep—as it is.

Routine verification of such key facts exposes an acute contradiction in the neuroscientific opinions purporting to localize mental occurrences at the physiology that takes place in the tissue's reference frame. For example, a dream-originated melodic *fa* note is sensed, but the same dreamer would not sense a *fa* note from the external world enacted in that same brain.

A deathblow to single motion-frame ''neurophilosophies,'' this crucial fact simply comes from the both-ways nature of relativistic transframing. Dreaming minds are usually asleep. These dreaming minds, which during deep sleep interact with extramentality from additionally accelerated force carriers (less slowed ones, whose motion may only subtract up to a scant 10^{-96} fraction from light speed), put the brain in electroneurobiological states (to which the mind then reacts by intonating herself with oneiric sensations) through a slower, yet not very much slower, time resolution. From the mentioned range of dilations, which correspond to subtracted fractions between 10^{-82} and 10^{-96} of light speed, the time dilations during dreaming are those that barely suffice to leave unresolved the sensory sequences, delivered for awake acuity. Such small yet sufficient excursions away from awake acuity are implied by the dreaming control of neural tissue and also by the not inordinate time that every dream takes; whence one might predict that, when the duration of dreamt module performances such as a walking step could be accurately compared with extramental time, it would show only a moderate stretching. The moderateness of such excursions is also implied by the oneiric interpretation of environmental occurrences, such as alarm activation or thingamabobs found in the bed.

The dreaming dilations thus constitute a deep inattention that does not result from the greater dilations, or larger deceleration loosenings, proper of ''nondreaming'' or ''deep'' sleep: in fact, when these dilations do not confine a dreamt episode to reasonable clock time, it is said that the sleeper ''does not dream.'' In turn, during dreaming the sense organs are putting the brain into electroneurobiological states that could be resolved if the mind had been circumstanced to carriers whose motion subtracted from light speed a far greater fraction, namely 10^{-82}—but that the dreaming mind cannot time-resolve so as to react at those states intonatively. Instead the mind's own causal action, transferred via those faster-moving sources, is transframed with the resolution proper to generate superposed brain states (states for the two fa notes are in the same brain region) to which the mind circumstanced to faster-moving force carriers reacts, as mentioned, intonating herself with the oneiric sensations. She operates, so to speak, her own domain of contiguous phosphenes with the extramental time resolution that she is currently availing herself of. Thus we do not sense the extramental occurrences while dreaming because the sensory input stays in a transiently unresolvable motion reference frame, which does not prevent minds from using the same brain regions in order to generate dreamt sensations.

How Do Perceived Features Fade Due to Inattention?

As the crucial observation of monohemispheric sleep (Mukhametov 1984) shows, the reduction, in the braking that the brain imparts to the causal carriers through which mind's action inserts itself in extramentalities, is regional. Brakening loosens and these

force carriers gain speed in some brain regions, not necessarily in all of them. In other words, although the process can be extended to the entirety of the brain's gray matter, basically it is in certain brain regions that the force carriers providing a mind's immediate circumstance move from one system of constraints to another. Things occur as if less dynamical electric states (i.e., simpler courses of the potential's variations) of the brain tissue, associated in mammals—but not in reptiles—with sleep and distraction, took less dynamical mass from the force carriers traversing through them, which to traverse every millimeter (refringency assumed) take some 10^{32} Planck instants. Because this short period amply accommodates the characteristic time of electromagnetic interactions, the carriers can be regionally ''freed'' from braking, namely gradually allowed to reduce the fraction of their dynamical mass claimed by the dynamic state of the coupling electric field that they go across in such regions. So, before exiting the brain and being replaced by others (just as the molecular components of metabolism do, if in a much more leisurely way and far more circuitously), these carriers speed up—gradually losing the circumstanced mind's resolution as regards the sensory formations built in these particular brain regions.

In this way, before the new speed becomes so fast that it completely blocks the resolution of sensory notices (as occurs during sleep), the regional sensory output fades ''into inattention'' around other features kept in one's attentional focus, without loss of its availability for semoviently steerable attention. In other words this fading sensory ''complement,'' which surrounds what one is attending to, loses affective prominence or force of imposition (Zubiri's *noergy*) because of the slight speeding up of the mentioned carriers in the brain areas that generate the voluntarily neglected sensory features. This mechanical ''reddening'' (more on this designation in a moment) is why inattention is a step toward sleep, another crucial observation. It is probably linked with ketamine's mimicking schizophrenias as a step toward its acting as an anesthetic; anesthetics as well as oneirogens, substances that increase dreaming time such as those in the leaves of *Salvia divinorum*, must act by way of altering the field-coupled neurodynamics. This mechanical ''reddening'' also prevents recalling the experiences lived under it, another topic discussed soon. Focusing attention thus consists in selecting (''esemplastically,'' a term that denotes the action featured, e.g., in selecting one or rather another finger to move), in some regions of brain volume, a limited sector of brain states that continue inducing optimal braking to the causal-action carriers where one is circumstanced to.

Thus the selected sector of brain productions is ''put in the focus of attention,'' namely these brain productions impose themselves in full noergy: they cause, in the mind's ontology, intonative reactions that blossom in full affective prominence, operative interpretation, and sensory intensity. One might say that they take full root in the mind, or fully radicate in it. At the same time, conversely, their encasing sensory complement is perceived with weaker force of imposition or fainter affective promi-

nence (less noergy, a process that at times is labeled ''absentmindedness,'' and considering its productive mechanism would be dubbed ''reddening'' if speaking of extramental actions rather than of intramental reactions). Such attenuated noergy or lesser radication prevents the progress of its detailed operative interpretation yet without loss of all its sensory intensity and availability. This occurs because the modulus of time acuity of the unattended complement differs from that of the far-previously memorized operations through which one can recognize its contents. In the limit, as a result of this process, consciousness is neither a part of every sensation nor is every sensation necessarily conscious, though it always is a mental differentiation and so is gnoseologically apprehended.

Attenuated noergy differs from the habituative blurring of the experiences had in the very focus of attention, whereby for example, one cannot easily distinguish (because of reiteration rather than inattentiveness) between the memories of welcome greetings when habitually returning home late at night, a hundred days ago, and ninety-nine days ago. Yet these memories exist, because their blurring is remediable (and one might extricate the reimagining attempt from the predicament) if simply one also finds attended-to marks to tell between both events. Likewise if shown a photo a busy salesclerk may recall things otherwise unrememberable about the unique visit to the shop made days ago by a particular customer. In contrast, the unavailability of a lecture's short section, finished a minute ago but ''unheard'' while enthralled by another pursuit, is irremediable. Let me outline this particular point.

Noergy is not an action whose energy might be measured or transformed in a manner observable by the public (or minds other than the incumbent), released by the braking of noematic carriers. Noergy is, instead, a reaction whose effects retexture the ontic consistency of the circumstanced mind, wherein by lack of time course her past stays unerasable—that is, causally efficient for gnoseological grasp. But no dimensional mirroring of actions with reactions is conserved across the brain-mind interface. This is why one could only arrive at, eventually, assess noergy in other minds in terms of transframing's departure from the focal attention value (zero departure makes 100 percent noergy), comparing force of imposition but losing its intonative dimensions. Where no minds are circunstanced, actions and reactions characterize each another with features from the same set. But in a nature that includes circumstanced minds, intonations are found that result from extramental actions that are depicted with a certain set of features, whereas those actions generate reactions depicted with another set of features.

This symmetry breaking is a very fundamental datum of the natural science that strives to describe a nature where minds are encountered. Force in nature appears diversified or segregated fivefold: we observe four ''basic forces'' or modalities of causal interaction—by name the strong nuclear force, the weak nuclear force, the electromagnetic force, and the gravitational force—in its actions outside us—and a further

segregated modality of causal interaction or ''basic force,'' namely the one whose action carriers undergo the speed variations that tune the circumstanced mind's time acuity, likewise from its actions outside of us (e.g., its effects in biological evolution), but moreover from our reactions to the variations of its states. These reactions are the mind's subjective intonations, or sensational phenomena.

The identification of this additional segregated physical force in our neurobiological tradition (whose earlier consideration of it had been misconstrued abroad as vitalism) as the modality of causal interaction in which the dimensional mirroring of actions with reactions is not conserved across the brain-mind interface, arose in the frame of comparative research completed here between 1964 and 1971 (Crocco 1963, 1971). However, this general force does not enact its mental effects in an experiential void. Each circumstanced mind is ontically textured by the sedimentation of her biographical experiences (''rememberings'') and undergoes a retexturing because of her noergic reactions to local variations of this extramental force (''sensations''). This retexturing can be properly rendered in terms of her previously sedimented semovient operations (''perceptions'') only if the time acuities of both match.

In this process, the developmentally built set of semovient actions that a mind recognizes in herself (as available for applying onto certain sensed content that neuroactivity delivered to sentience, as nonstructural sensations and their structural patterns—for example, as a certain array of phosphenes) plays a role. This particular set of the mind's possible actions is the subset that gathers those of her operations that ''conserve'' (i.e., keep identifiable) the phosphenes' sensational patterns across operative reequilibrations, e.g., combining mental operations themselves plus their reverse executions. This makes it possible to ''recognize'' the sensations and their patterns in the operational terms that render them perceptions. They no longer just display meaningless phosphenes. What in all this does matter to noergy is that the full articulation of those sedimented operations cannot be applied onto poorly time-resolvable or time-unresolvable sensations. In this case, their texture inserts itself feebly into what the mind knows as semoviently doable. Noergy's other names, ''force of imposition'' or ''affective prominence,'' refer to this imposition of each sensory or (reimagined) mnesic mental content onto the equilibrable structures of semovient operations in which the mind's ontic-ontological consistency has become constituted with development—that is, since a long time ago. (''Affective,'' in ''affective prominence,'' does not point to sentimental affairs. It refers to the *affecting* of the equilibrable structures of semovient operations by each sensory or reimagined content, namely the degree of detail in which it admits the application of the mind's constitutive structure of semovient operations.) Throughout the successive stages of the growth, the mental operations attain a particular structure, called intelligence, whose specialized or ''factorial'' articulations establish how one ''sees'' the surroundings and oneself in them.

These acquired structures of operations, coming from way back in life, were of course originally acquired with the intrinsic time graining of the attentional focus. So their execution, even incipient, requires an additional operation—which would create a new esemplastic reclustering, regrouping elements into new accidental units—to be matched with the time acuity of the contents of the unattended, encasing sensory complement so as to interpret its contents in operational terms.

If these unattended contents are not put into the focus of attention, by way of this esemplastic reclustering, in operational terms they remain interpreted in low detail, outside of the organizational scheme being considered; that is to say, ''folded up'' in the vein of the complicated combinations of logic-mathematical operations substituted in mental treatment by a simple indicator (or by a single sign in writing). This condition of *abreviated scheme* is called ''unattended.'' The name means that, operationally, the sensations are undetailedly sorted out: just sketchily categorized.

This links up sensory time resolution with mnesic operational resolution. Attention grants full objecthood because, for categorizing its sensory content, the combinable operations sedimented in the sensing mind are not blurred either by fusion (as occurs when these operations' time structure results are too tight to become resolved in the frame that presents the sensory content) or by scattering over time (as occurs when these operations' time structure results are too lax to be encompassed as a group in the frame that presents the sensory content). This is also why the attentional reclustering, as it restructures into new figure-background termed the focal ''field of attention,'' often disrupts other operations that might being made.

Yet before a voluntary refocusing of attention allows recognizing unattended occurrences, a mechanical arrangement or ''machinamentum'' sets up the scene, and then becomes intentionally implemented. Unheeded sequences—for example, a song to which little or no attention is given while reading—become impositively fainter (affectively less prominent) rather than slower because their pattern is embodied by modulations of cycle warpings, or hysteresis losses, in the brain's electric field oscillations whose cycles become partly included in the mind's modulus of acuity.

Basically, shifting attention slows a number of the noematic carriers that form a mind's immediate circumstance. Shifting attention slows the particular ''volley'' or cast of action carriers whose states thereby generate in such a mind intonative reactions with full noergy (''in the focus of attention''), by increasing their coupling to the brain electric field. In more familiar terms, every voluntary shift of attention generates a new local or regional dynamism of the brain electric field, which allows the next cast, of those action carriers that form a mind's immediate circumstance, to ''affix'' or ''absorb'' more of their dynamical mass into the coupled, electromagnetic field (whose action they do not carry); involuntary, physiologically originated shifts of attention proceed in reverse, starting at the electromagnetic field's state rather than at those

other force carriers that form the mind's immediate circumstance. This ''absorptive redistribution'' keeps those carriers' inertial mass (and their absolute dynamical mass) unchanged, but decreases their speed. This occurs, for example, in regional hysteresis losses when a voluntarily shifted, regional change—which might compose the electroencephalographic pattern—increases or decreases the causal modifications (''inflections'') of this field's dynamic, while proceeding conversely (respectively, decreasing or increasing them) for its occasional ''neglected'' background. What matters is the course of the coupled inflections, not the electroencephalographic synchronization or desynchronization itself: as commented, reptiles and mammals keep paying attention on opposite electroencephalographic regimes; moreover, electroencephalographic activity includes a great deal of potential variations concomitant but unrelated to the mind's actions and reactions (see De Vera et al. 2005). Thus, whether stirred by the circumstanced mind (voluntary attentional shift) or by her brain's physiology (involuntary attentional shift), the brain's resulting regular action on its circumstanced mind enacts, in her, intonated reactions with variable noergy—that is, more or less interpretable in operational terms.

By a single causal means, the mind's semovient action on the brain tissue in turn enacts

1. Displacements of the focus of attention (described here as ''esemplastic reclustering'' or shiftings of the accidental unity attentionally conferred on some objects, whether over one's mind extant ontology—for example, searching for a memory before recalling it, the mind being active in one respect and passive in another—or over the sensible presentations currently offered by the brain, as while reading these lines a good deal of the surrounding events becomes sidelined by weakening their phenomenicity's impositive force)
2. Bodily motions, for instance, moving a finger rather than another (in which what is shifted is the electroneurobiological state modulating the neuronal activity that generates the finger's displacement) or opposing resistance to sleep (in which what is shifted is the electroneurobiological state modulating the neuronal activity which generates the electroneurobiological state that slackens time acuity)
3. The mind-facing, feature-determining brain states generated by the mind herself, to which she reacts with dreamt sensations while escaping from sensationally reacting to the feature-determining brain states established by the sense organs

How are Voluntary Movements Attentionally Determined?

Likewise, the attentional selection of a particular portion of the mind's corporal scheme for moving the related body part—say, a certain finger—puts in the background the mental images of other bodily parts. Namely, of those parts that are not to be voluntarily moved, or moved differently, as in juggling. This makes the mind's

causal action effective only for those segments of brain architecture—in fact, nonstatic ones and varying with practice—that, through acuity-matching electroneurodynamics and the causally related biochemical processes spatially arranged within it, trigger outward the willed movement.

This intentional process generates a voluntary modulation of neocortical electric dynamics accomplished in everyday behavior, such as in waving a hand. Bypassing the hand, the resulting neurodynamic modulation, or its metabolic/hemodynamic concomitants, make it possible to communicate or activate external devices without muscle activity, using electric brain signals—nothing more ''mind reading'' or thought transducing than reading the results of any other willful communication or activity, such as properly ''waving'' the hand on a keyboard, or talking into a telephone or into the air in front of a face-to-face interlocutor. So, for example, the voluntary modulation of neocortical electrodynamics is also used to gain control over a motor imagery–based system in the coupling of electroencephalogram-based brain-computer interfaces with a neuroprosthesis. The neuroprosthesis is thus operated by voluntary generation of distinctive EEG patterns, which usually are power decreases in specific frequency bands, at imagined consecutive movements of a paralyzed limb, so that the patient is able to move a simple object from one real place to another, or navigate in a virtual environment (see Muller-Putz et al. 2005; Leeb et al. 2005; Kubler et al. 2005). Several types of brain signals have been explored for this use, among them slow cortical potentials, cortical neuronal activity, and beta and mu rhythms (see Santana et al. 2004; Yamawaki 2005), whether through systems fully implanted in the brain or still invasive microminiaturized ''neuroports'' (Patterson et al. 2004), or noninvasively (Wolpaw and McFarland 2004; Hinterberger et al. 2004; Yoo et al. 2004) such as in EEG biofeedback. The latter, also called neurofeedback, is a rather trivial training technique—frequently accompanied by commercial or superstitious claims, too—designed to teach people, by trial and error, how to increase specific frequency bands of their brain waves on receiving real-time feedback of their scalp-recorded electroencephalographic rhythms (Egner, Zech, and Gruzelier 2004; Weiskopf et al. 2004; Weiler et al. 2002; Congedo, Lubar, and Joffe 2004). All these examples indicate that shifting attention is a part of every voluntary modulation of neocortical electric dynamics, independently of the causal chains appended afterward, such as vocalization, writing, manipulation of external devices, or any other motor action.

Specifically, it makes the mind's causal action effective only for those brain segments that have developmentally turned up as such, themselves not thought about—because no brain segments are intended, but their action's outer result—but operatively identified by the individual only in terms of this connection. We might note in passing that the voluntary reimagining of a certain memory does not greatly differ from the voluntary waving of a certain finger. Rather than using the anatomical connection to

a particular body part, the segments of brain architecture enact the electroneurodynamic states that put the mind's immediate extramentality in the state that makes her nomically react by such reimagining. More on this below.

Once They have been Recalled and Given Attention To, Where Do Memories Again Fade Into?

Mnesic localization, aimed to find an episodic memory already known as available (''known as known,'' although not yet remembered), is carried out in the current inattention domain. This inattention or inoperativeness domain is also where memories recede, or are ''reforgotten,'' when no longer imagined. This is an inattention in which they are ''folded up'' as abreviated operational schemes. This means that do not stir, in any degree of detail, the application of the equilibrable structure of semovient causal operations that constitutes them. In their inattention domain, the only operative articulations available are the attention-focusing operations that navigate the biographical sedimentation through its larger posts. These navigating attention-focusing operations are external to the operations that imaginatively unfold the remembering's individual units; the former merely specify the latter in biographical context.

From this inattention domain every memory arises, when it is reimagined after so having been ''localized'' (rather, operationally specified) in the operational availabilities of the observer's biographical sedimentation. There, experienced reactions cannot elapse because the observer's ontic reality lacks a causally efficient multi-instant course consistency, which could vanish its former states inside the mind's single-instant actuality that, with causal efficiency, is achieving inner and outer changes. But her memory is far from being any laying down of archival data, or sedimentation of news that in future times is to be merely contemplated, ''unoperatively.'' Memory is the sedimentation of nonsensorial habits of motor schemes whose sensorily intonated reimagination, though it allows believing that certain features stay in it awaiting discovery by exploration of the completed mental image, in fact receives these features when one adds them to the reimagination with the mere act of thinking them, one after another.

Thus this operational specification (''localization'') among other availabilities (''visio generalis'') is not intrinsically different from that of the proper fingers when, for example, having crossed the second under the fourth finger of a hand, one is summoned to move a certain one of both fingers. This kind of mentally led extrication, instead, becomes ineffective when a patient with small areas of brain damage, despite great efforts, could neither name nor describe the function of a glass of water that he, a little later, reaches for and from which he takes a drink—by using undamaged brain portions whose performance is not coupled with the attentional focus. One's corporal scheme includes the sedimentation in one's ontic consistency of one's causal involvements, which are to find their respective neuroactivity to produce their reimagination

just as, using the bodily scheme, one is to find the respective neuroactivity to produce the proper action.

The conditions of this neuroactivity are, organically, quite specific (e.g., activity of the CA3 region of the hippocampus is key for recalling our memories from fragmentary representations) and it may easily become inadequate because of factors extraneous to the attentional selection, such as finger ''braiding'' or cerebral dysfunction. Thus, recalling one's memories and moving one's limbs employ an attentional reclustering of one's sedimented operations in order to put such particular availabilities into conditions of reenactment—that involve reattending to them (i.e., their proper time resolution).

How Does Inattention Cause Amnesia?

The same specific mechanism also prevents remembering most sleep mentation after awakening; dissociates the handiness of awake rememberings from oneiric threads (and of oneiric episodes from awake decisions); puts distractions before forgetting in the beginning of dementedness processes; turns status epilepticus with more of a propensity to anterograde than to retrograde amnesia; and, in traumatic memory deficits, makes the recall of the pretraumatic (retrograde) portion of life, forgotten in a mnesic lacuna or memory ''lagoon,'' depend on the same lacuna's posttraumatic (anterograde) portion or ''amnesia of fixation'' period.

In all these cases, the biographical episodes lived from a certain time dilation (say, dreamt; or perceived through a sane brain tissue long before a dementia's initial stages; or lived and memorized before the brain tissue became concussed and later recovered leaving a posttraumatic ''amnesia of fixation,'' to consider three examples) can no longer be operatively categorized when the relativistic speed state, of the biophysical components that form their experiencer's immediate circumstance, changes into another relativistic speed state (respectively for those three examples: (1) in awake life; (2) sensed through a deteriorating brain tissue, in a dementia's initial stages; and (3) recalled through a reimagining context that should have included the episodes forgotten by ''amnesia of fixation'').

During the attempted recall, when the relativistic speed state of the mind's immediate circumstance differs from either the speed state through which the episode was lived or from the speed state through which temporally neighboring episodes were lived that should have been included to reimagine the context by drawing closer—backward in memories' sequence—to the sought episode, the difference hampers the arrangement, by voluntary recall, of the brain physiology so as to generate phenomena that might be recognized, in operational categories, as the aimed-at memory. On this attempt act the physiological abnormalities that head blows bring about.

For a time after the encephalic concussion, the brain does not tune its electroneurobiology so as to furnish proper time dilation to sensory experiences. So these

experiences lose impositive force, or noergy. It results in a condition similar to that involved in the fading, into ''distraction,'' of many memories of the habitual life lived in the months or years after bereavement. Thus at their occurrence one perceives the sensory experiences just as one perceives scarcely attended-to vehicle and foot traffic around the bus in which one travels. These scarcely attended-to vehicles and footers are well seen, heard, and identified in some incipient detail but soon, even perhaps before one goes out of the bus, one cannot put their perceptions in any order so as to recall their presentation. The same occurs to all the life episodes in some (often transient) postconcussive stages.

Such a process is called ''distraction'' when it intrudes on one's plans, as when, while reading, one plays a music disc with many songs and sometimes find that the themes that one most wanted to hear are finishing, have been ''heard,'' yet their memory—though recent—is irretrievable. To stir the affects and emotions one wished to draw from the audition (in this case more obviously called ''affective prominence,'' though always stirred after operational categorization) they should be played anew—and listened without reading. Preventing it is why, illustratively, theaters impose silence and darken the seating precisely when performances commence.

As it should now be plain, this ''distraction'' is what in clinical contexts is called ''fixation amnesia'' or anterograde amnesia, namely difficulties in learning new informations. In the beginning of dementias it precedes the older memories' unreimaginability (forgetting), and the same mechanism also conditions the possibilities of awake and dreaming states for reciprocal recall. In sleep mentation it also brings about the ''attentional narrowing,'' the thematic or experiential reduction that impoverishes one's full experience, shrinkening the menu of other experiences that one keeps available to be collated with the actual contents of an oneiric thread in such a way that—above and beyond more specific cognitional effects—while dreaming we are habitually unaware that we are in fact in a dreamworld. On the same basis, it also sets the distribution, over the sleep period, of the dreams that include ''diurnal rests.''

Noergy disparities reflect not absolute but proportional disparities in resolution, as shown by the common observation that the experiences that closely precede powerful emotions, although acquired with unweakened noergy, are as likely to be forgotten as those of the enthralling emotional event's experiential margin, which, instead, faded into ''distraction'' at acquisition time. They cause people awakened after having slept more than a very short while to typically be unable to recall the last few minutes before they fell asleep, and also make people prone to forgetting phone calls or exchanges they have had in the middle of the night, or the alarm's ringing in the morning if one went right back to sleep after turning it off. Likewise, acquisition with decreased noergy accounts for why in memories ''diluted'' by anterograde amnesia, no recovery is observed, similar to the gradual reinstatement of pretrauma memories common with retrograde amnesia.

When Is Neuroactivity Nonconscious?

By way of establishing mental contents, segments of neurodynamics became linked—through, therefore, a mind or existentiality functionally positioned in a superior level of organic regulation, which addresses molarly its objects and lets in semovience and tunable motivation—with the novelties from the environment and other neuroactivities. At the same time, other segments of neuroactivity remain just substratally connected, processed through microphysical causality. In fact they evolved quite apart and upon parallel processes of natural selection, a topic not studied in this chapter.

Brain-mind relationships display a fundamental form of locality, which sets a foregoing bearing on which neuroactivity might be experienced: while the electromagnetic field is continuous all over nature (spatially, every physical field *replet orbem terrarum*, or in modern terms it fills the whole universe), not all minds react to a brain's electrodynamic patterns (even when these patterns become to structure the nonstructural, intonative reactions of some existentiality's experience). Only does so the mind whose extramental immediacy is locally coupled to them, on a determination more substantial and basic than these physical exchanges. For every psychism, therefore, all foreign neuroactivity is forever nonconscious.

Yet, even for this particular mind, not all of the ''local'' neuroactivity specifies new mental contents. Through reduction in the reactions' force of imposition, a variable amount of local neuroactivities is for her as much unconscious as it is for all the minds circumstanced to different drifting localities (or parcels) of the same field. This nonconscious condition is also to affect neuroactivity by way of unsuitable transframings. Excessive ''neglect,'' preventing to demarcate mental contents, is to happen when, in loosening up the brakening electrodynamically forced onto the causal carriers which a mind reacts to and where the mind's action inserts itself in extramentalities (by loosening the electromagnetic field absorption of their dynamical mass) the patterns that neuroactivity might form (in the mentioned hysteresis losses of the brain electroactivity coupled to the causal carriers) turn up transframed with a time dilation that so much weakens the force of imposition, of the intonative reactions to these patterns in the existentiality's ontic consistency, that those intonative reactions merely compound in the sensational background noise of this existentiality.

Neuroactivity nonconscious by noergy unproductiveness may include a variety of physiological processes. Some of these, coming chiefly from genetic determinations, participate in the determination of ''instinctive behaviors'' such as prey capture, nesting, flying, and involved courtships that in many species may go on without psychism. Others, in empsyched animals, come from the inner needs of ongoing courses of action (such as the loss into inattention underwent by the routine details of learned abilities, or by equilibration in ''instinctive'' flying) and from current stimuli (''tacit'' processing).

Cerebral architectures may optimize the addition, onto some regional function, of its gnoseological apprehension with adaptive time acuity—or either, moving on a workable physical range, may leave such cerebral operation uncharted in mental differentiations, namely unsuspected by the mind that senses and control other activities of the same brain: unbeknownst to the circumstanced existentiality. The time dilation that when spread over the whole tissue knocks out noergy to all of the brain's possible productions is that of deep sleep. It is a *ligamentum sensus* which nevertheless leaves for mentation all of the mind's availabilities and her memories in the visio generalis—so one can explore them and, when in some brain areas the time dilation comes closer to that of the awake state, such exploration cannot help but reimagine them with aspects not very removed from the ones which the episodes presented in awake life. In the middle of this workable range, diverse levels of inattention are available to apply onto the mental products of such cerebral operation.

In this way—that is, spatially diversified as regard the transframing-inflicted time resolution of its patterns—a great and variable deal of neuroactivity is often nonconscious: it remains ''unconscious'' and, so, foreign to any existentiality, not specifying new mental contents. Many electrodynamic leakages from the functioning of intracerebral ganglia stay unrelated to the generation of mental reactions. Other segments of neural processing induce low-noergy, unattended sensoperceptions. A case in point, the control of low-frequency cortical electrical activity by respiratory activity in a lizard, has been worked out by De Vera et al. (2005 and earlier research); the evidence is not at hand to enable determining whether or not reactions to this induced activity are present to the experience of the incumbent existentiality. Still other segments of neuroactivity induce, in the focus of attention, sensoperceptions whether semoviently fancied or, instead, continuing environmental causality (namely, sensorially acquired sensoperceptions).

How Are Memories Semoviently Recalled and Recognized as One's Own?

Situating in autobiographical context one's memory of an episode, whose reconstruction is being voluntarily ''recalled,'' means semoviently arriving to focuse attention on the same possibility, of combining equilibrable operations, which one had when the episode occurred. As Aristotle described it in *Perì Mnéemees kaì Anamnéeseoos* (''On Memory and Reminiscence'') 451b30, ''When one wills calling to mind, what one should do is this: one will try to obtain an initiation of motion whose follow-up be the movement that he wishes to experience again.''

One's conception of the results of such actions is the entirety of our concept of the object, which even if unrepeatable as a unique biographical episode is to be replicated in imagination, any number of times, just as defined by one's operatory possibilities that make its elements recognizable or understandable for oneself. Hitherto my discus-

sion of what is known in nature considered intonations, which are mind reactions, and now I should put an important addition in. Also semovience is perspicuous: the will provides its own certainty. This is what allows to mnesically sediment the patterns of our semovient actions.

The motor effort is grasped through an inner immediate apperception: one's causal act unfolds itself on gnoseologically apprehended dimensions constitutive of its agent—that is, of oneself. In our tradition's view, this postdecisional apperception is that of a reaction, which is unintonated or non-phenomenal (some also label it ''nonsensory'') as the enactment exhausts itself in the extramental act. When the causal efficiency of the semovient action causes a modification in the hylozoic hiatus, it directly enacts a real modification of the immediate circumstances but not of the mind. We do not feel it. What thus we grasp is our having closed a situation open-ended at its conditions. We react to our doing, not to its outside-exhausted causal efficiency. The subjective evidence that semovience is perspicuous includes, among the multifarious actions that one originates, the production of our inner voice. In addition to subjective evidence, we objectively observe that semovience is perspicuous in two situations. First, the knowledge that animals developmentally gain become adequate to deal with extramentalities (and *thus* the acquisition of this knowledge was evolutionarily selected) and to successfully handle extramental causation, though this latter eludes observers forever. Second, as François-P.-G. Maine de Biran first observed, within the knowledges that minds gain a quite exact line demarcates what there is of passive and of active: habitual repetition contrasts the notices about minds' reactions and the notices about mind's actions. This turns particular procedures into particular memories.

Particular memories, therefore, are particular procedures to generate the mentioned meanings in the context of the biographical texturing of a mind's ontological consistency. Although procedures always differ, their meanings can be shared. How to pinpoint at any later time, in order to reimagine some memory, which these possibilities were?

These operatory possibilities are of course filtered through the difference in time resolution between the time acuity with which the episode was lived and the time acuity which one is installed on at recall time. This filtering compels to progress in imagination probing a range of such differences until one arrives to reimagine the set of operatory possibilities established by the sensoperceptual contents of such a past moment. This set provides the famous ''associative links'' that glue special groups of interarticulated memories. Sharing in relativistic dilation is thus an essential component of memories ''association.'' Nothing to wonder about, actually, because the sharing is required to spot, as a unique performance, the operations that constitute every calling to mind.

These grouped memory elements to be ''associatedly'' recalled share in the time acuity under which their extramental occurrences had been resolved. This is why one can arrive to recall a particular object that compounds in a past situation, from the reconstruction of other elements in the situation's group delineated with its same relativistic dilation or, instead, contemporary elements memorized from a different time acuity—but in the latter case an additional operation is to be carried out.

The additional operation should transform the original situation, e.g., into paying attention to components primitively unattended in the memorized situation. One first reconstructs the biophysical time acuity in which one was when one lived the episode to be recalled—for example, awake or asleep; focusing on the episode's accomplishment or only marginally attending it, detached perhaps by grief; stuporose, or chemically influenced. Like moving a finger, the semovient operation modifies the brain state. In the case of a ground-gaining retrieval, it puts the brain into the states outlined below, which the circumstanced mind reacts to intonatively by imagining the autobiographical episode. Then, within such a time acuity, one attentionally reclusters the elements, regrouping them into new accidental units until finding some component of the sought situation, thereby finding the operatory possibilities that define in it the searched for memory.

These operatory possibilities again become available as the object that they conserve (the past situation) is reimagined. That is to say, the availing of this particular set of operatory possibilities defines the searched-for memory and such operatory definition squares with the ''associated'' context in the time-resolution reference frame. This squaring of one's sedimented operationality with the reimagined elements (and not any special emotion serving to tag recognition) is what provides recognition to the reimagined memory as one's own, namely that an episode is being imagined because it has already been happening to one earlier: as a recall, then, and not as a fancy.

Definitely such a resource is fallible. With a little experimental ingenuity it may be cheated. Nevertheless, in evolutionarily typical situations it is reliable since it depends on the real system of Piagetian-equilibrable operations built by probing the reactions of similar situations to one's semovience.

Yet, to be voluntarily recalled, biographical experiences must have been sensed; but, had they been sensed with deficient force of imposition, they could not inchoate their understanding in praxical terms. Put differently, had they been originally sensed out of the focus of attention, their full categorization by the concerned individual was hampered. This, later, hinders forever their recall. Namely, for reimagining them, a large amount of operational categorization is to be added that did not enter the original experiences and, if at all appended, is rightly recognized as purely fanciful, or nonoriginal. This is why the head-concussion clinic shows, as mentioned, that in contrast with the gradual reinstatement of pretrauma memories unrememberable as they fell in

the retrograde segment of amnesia, no recoveries are observed of the experiences unrenewable as they came under the anterograde segment of amnesia.

Along these lines, noergy enters in the conditions of possibility for recall. With it, noergy brings in nonpersonal (or, mechanical) issues about time acuity. Before lack of fine-enough time acuity lays sensed events into unresolvability, subresolvability comes as noergy debilitation. The life experiences that one leaves go past with such enfeebled impositive force—as forgettable, undealt with minutiae out of the focus of attention—remain thus unrelated with the biographical thread attended to. In other words, they remain deprived of the workability hermeneusis, namely, of their *noûs poieetikós* construal in terms of what one is capable of doing with them through one's own mental maturity and means at hand. This workability hermeneusis would have been needed to categorize each of such lived experiences in terms of one's semovient operations, which by enacting causally efficient actions turn its schema cognoscible, so as to effortlessly localize it in the simultaneized sequence of one's past doings and, therewith, reimagine it in voluntary recall.

Why Is Sleeping Right After Learning Better for Retention Than Remaining Awake?

In sum, the organization of memories reflects the reference frame in which the original experiences were lived. This reference frame determined the time resolution of the referred-to extramental occurrences. As shown by dissociative disorders and hypnotic suggestion as well as regular experience, one can alternate recall from groups—for example, one can pass from memories of awake life to memories of oneiric life. Yet this passing is an additional operation—one not called for by the recalled content itself.

Although the pace of the observer's ''own time'' never changes, oneiric experiences are lived on a time dilation (which stretches any observed outer intervals or dilutes the pace of the observed extramental courses, including those of brain processes) differing from that in awake state. So, regarding oneiric experiences, a previous learning achieved in awake life (before leaving its items aside the attentional focus, then going into more generalized inattention and sleep, and then dreaming) remains in a different reference frame. Each reference frame allows reimagining the experiences from the other frames with improper noergy or force of imposition, namely unattended. Thus sleep prevents the ensuing awake life from interfering—turning elusive the study materials learned just before the sleep interlude—so much as the ensuing awake life interferes on study materials learnt without sleep interlude. Whence people tend to remember things better if they sleep after learning them.

This occurs as interference affects organized and well-recognized contents but not their *brute mémoire* or unrequested raw memory, a passive remembering in which events come to mind unbidden, or intrusively. Retention and recognition happen in such blocks, whose organizational schemes are operationally deployed and need

the said additional operation in order to integrate contents lived in different frames. Or, memories are retained and recognized in blocks whose compounding operations are grasped as a unified performance, and every block includes the contents of experience had either in the focus of attention or, with less operational recognition, outside it.

When the recall is being done from the same original time dilation, these unrequested contents may reappear as *brute mémoire*. Similarly, other contents fade away also in block. This makes the orientation reactions to surprise and the background interceptions detrimental, causing the unexpected failure to rediscover the thread of thoughts that a minute ago one was fluently developing, a feature so much familiar to schizoids as affrighting for anxious lecturers. Likewise, conversely, the better retention of materials studied before sleeping builds on the lack of interference from the same motion frame. Since recalling demands being made from a time dilation that matches the original acquisition, any crossing the contents' borders to include materials from unattended sectors, or from oneiric experiences, demands from the remembering person a special operation to transport the reimagining process into the same reference frame in which the memories were originally made.

What Is Imparted When One Pays Attention to Something?

That which is contributed is the operationalizing of its sensations. In other words, one thereby applies, to a sector of one's sensory field, the acquired system of equilibrable operations sedimented in one's ontic-ontological consistency. This system allows to operationally categorize sensory contents with some particular detail. This, in the case of memories, is the mentioned workability hermeneusis, but applies also on sensations stirred by the ongoing activity of the sense organs.

Such a system of equilibrable operations, which one avails of all at once by their sedimentation in one's reality, integrates the current ontic-ontological consistency of the circumstanced existentiality and makes known to her what she could do with the entities referred to by those sensations. Instead, the sensations outside the attended-to focus remain less detailedly categorized (namely, less ''operationalized''), altough operationalizable, which means operationally categorizable. This, had it taken place, would mean that these sensations were put into the focus of attention and remain no longer in its fringe. Those sensations that stay in the less operationally categorized fringe nonetheless receive a preliminary, automatic categorical distinction as, without mental discrimination, it is provided by nonconscious activity of neural analyzers, but if the attentional focus never worked on them they stay as almost unretrievable memories (anterograde amnesia). They are forgotten and, inasmuch as uncategorized in operational terms, are almost unrememberable because cannot be defined and identified in operational terms (infantile amnesia). Away of the current focus of attention, this fringe is continuous with the availability of operationally categorized rememberings

that are to be localized in the quasi-spatial distribution of acquired differentiations and, then, reimagined in voluntary recall.

Does the Overlap of Time Resolutions Automatically Generate Recall?

No, because the evolutionarily selected development is efficient and most minds do not stay for long untextured. In most cases, before long bodily interactions become functional and the mind starts to differentiate her initiatives as linked with her reactive intonations arising at her undergoing the surrounding's feedback to such initiatives. So, with the successive developmental periods, her living reality becomes differentiated into the system of her possible, equilibrable semovient operations. The structure of this system of operations establishes how she sees the sensations being stirred by the surroundings and the sensations that she might herself stir to reimagine her memories.

Had an existentiality's ontic-ontological consistency remained untextured (*tabula rasa*, as the untextured condition is traditionally referred to in Aristotelianisms), no possible change in mental contents could arise from changing the magnitude of the time acuity with which, at any rate, she (such a *tabula rasa*) could not discern within herself anything in semovient-operational terms. In other words, coarsening or either refining her time acuity (by way of varying the speed of her moving operative localizations, as this speed is counted from some outer reference frame) would not vary any experience (which always is experience of changes in herself) referable to processes in the outer frame—because, this existentiality still being a tabula rasa, such outer processes are not yet reflected into her mental differentiations. But, with development, a mind's ontic-ontological consistency becomes textured into some particular shape.

She finds herself ''differentiated.'' This differentiation in operational terms, or mind's live texture, is supplied by the sequential sedimentation of her past causal involvements (''biography'') whose experienced reactions cannot elapse. Thus the experienced reactions of her past causal involvements stay simultaneized (''memory'') while successively added with new biographical experiences (Jakob's *frente matesomnémico de registro*; for didactics, Jakob's followers sometimes compare it with a—time-thin—onion nonetheless developing its structure with leaves of diverse thickness). After such developmental texturing comes about, it becomes possible for its causal-process acuity to match or not to match the time acuity proper for referring a particular set of mental differentiations to processes of biological relevance occurring in the other reference frame.

In the same way, the time acuity of the equilibrable operatory system might, or might not, allow the application of the available semovient operations to the differentiations that become revealed as the current time acuity varies. And the inchoate, ''embryonic'' or very preliminary application of those semovient operations—with their possible development in view—is what identifies, categorizes and recognizes all memories. Thus a matching with the current time acuity does not mechanically generate

recall. It does this only inasmuch as the proper matching of the time acuities, those of the original acquisition and its current knowledge, allows applying the system of equilibrable operations in which at this time the mind's ontological consistency consists.

What Is Voluntary Recall?

Voluntary or conative recall is the semovient act of retrieving a particular memory originally acquired at a time in the past. On recognizing its operational structure, such a memory is reimagined by setting up, the most likely with intervention of the frontal lobes, a dynamic electroneurobiological state whose tuning normally involves the hippocampi, the dorsomedial thalamic nuclei, and other brain structures. These, if damaged or lost, might occasionally be learnt to be replaced with other cerebral tracts, though less efficiently and after hard exercitation.

The said electroneurobiological state is first to match the time acuity which the memory was originally experienced with, then to generate, in the circumstanced mind, intonative reactions structured to match the particular memory as it was previously identified in her visio generalis (when selecting it for recall), then to modify the reimagination process upon operative equilibria that conserve the particular memory as object of these modifications, recognizable through them. Assuming that some pharmaceuticals have potential effects and therapeutic use on learning and memory deficits is, thus, assuming that those drugs may improve the brain control of the regional speeds of noematic causal carriers, attenuating or protecting against the brain dysfunction—what only improperly lets labeling those drugs ''cognitive enhancers.''

Conative or voluntary recall does not differ in enactive mechanism from the semovient act of moving a finger, as we saw. Yet conative recall entails more complexity in the production of the physiological conditions to handle the segment of the ''bodily schema'' that, through sedimentation of the existentiality's past causal involvements, includes the relations of the mentioned particular memory with the remaining differentiations (which comprise those of the finger) in the existentiality's experience-textured ontic-ontological consistency.

Through as yet unknown mechanisms, injury to the hippocampi and dorsomedial thalamic nuclei is observed to put new experiences into the fringe of low noergy, which comprises the not-to-be-retained perceptions, such as the mentioned ones of passersby and vehicles when one is driving. This allows the contemporary handling of these experiences (thereby one steers clear of traffic accidents) while hindering their subsequent recall (anterograde amnesia). It yet does not hinder that other brain structures remain in conditions of generating, though multiple combinations, the dynamic electroneurobiological state proper to reimagine the memories that, in contrast, were originally acquired in the focus of attention—thus shunning retrograde amnesia.

Retrograde amnesia, which always is a failure in remembering the so-called long-term memories, instead takes place when injury to less specific or architectonically more basic brain structures disrupts the fine control of the electroneurobiological state's dynamics, preventing to set it up as to produce in the circumstanced mind the reactions recognizable as matching the visio generalis of the particular memory sought to be reimagined. Short-term memory does not require that the hippocampi, dorsomedial thalamic nuclei or any related structures build a dynamic electroneurobiological state in reaction to which the mind reimagines an old memory, this being why the loss of both hippocampi does not impair short-term memory.

As full, reviviscent recall is reimagining, it involves both active and passive roles important to tell between. Sensing is always passive, whether the intonative reaction underwent by the mind was caused by extramentality or by the mind's operations. And those intellectual operations generating the brain states that intonatively flesh such a mnesic reimagination are of course active, like those intellectual operations generating a finger waving that makes some signal. The fact that the gnoseological apprehension of these ''of course active'' operations is a noetic act might mislead one into mistaking it as wholly active, while in fact it passively undergoes being determined into cognoscitively apprehending some such combination of operations (that generate a recall) rather than any other. Just as one may passively notice the involuntary growth of one's hair, one also may passively notice the effect on the brain of one's voluntary acts. And, before this effect on the brain is produced, one may passively notice the yet-to-be-enacted operatory combination as one's gnoseological object. This apprehension is thus not the termination of the mind's act of shaping her object, but another going through her being passively determined. Our mind mentally behaves as it was developmentally learnt through bodily behavior: as she operatively shapes the mental content which she originates, she becomes bound to understand it passively. In this act she ontically proportions itself toward undergoing the intellection of her own act; in regard to this intellection she is entirely passive, just as she also is in regard to any sensation whether mentally or extramentally caused: she cannot cognoscitively apprehend any other thing than what she really is to operate. This apprehension is that of the operative sequence learnt as the one capable of shaping the object, a shaping sequence that is apprehended as a whole and inasmuch as repeatable: that is to say, inasmuch as reimaginable (''rememberable'') at any time by repeating the whole sequence. It is thus noticed as able to put the brain in states that produce the mental intonative reactions fleshing sensorially the object (which may be a remembered episode, biographically unique) without any loss of the said repeatability or generalization.

What Is Gnoseological Apprehension?

The above outlined facts offer a stark contrast with the Peripatetic understanding of knowledge as a sector of metabolism, a view of knowledge that leaves aside both its

cognizableness and this cognizableness' unbarterability. By its referring to different realities through one broad term, this Aristotle-stemmed understanding is the source of the familiar conflation of ''knowledge'' and ''information.''

The Peripatetic tradition in gnoseology understands ''knowledge'' as such acceptance in the knower—of the ''Form'' supplying full inner-and-outer shaping or ''conformation'' to another thing—that does not thereby *trans-form* the knower into the known thing, an assimilation which instead occurs in other metabolic incorporations—for example, as food becomes the fed organism. In this way, by knowing one escapes transforming oneself into, say, apple in (just) becoming acquainted with an apple, despite receiving in oneself the apple-forming Form. This standing back, or ability to receive the Form yet escaping the pernicious transformation that it might otherwise bring about, is knowledge's distinctive feature in the metabolic descriptions of the Peripatetic tradition. It includes a vigorous branch of Scholastics active since the thirteenth century and nonconfessional scholars such as Maturana, Varela, and followers who call knowledge ''cognition'' and conflate it with ''life.'' Clearly this classical, informatic conception of knowledge as a biological topic (''*Biologie de la Connaissance*'') neither intends nor approaches the issue of what the gnoseological apprehension is—that is, what the cognoscitive event or noetic act does itself consist in.

As a result, the Peripatetic understanding of knowledge has been extremely valuable as a conceptual tool, precisely because it applies to nonempsyched organizations such as the sensitive soul of corals and worms, or the compliant mutual accommodation of the ''castes'' of eusocial insects, as well as to the mental contents differentiated by existentialities and, also, to the informatic content of data processing machines—whose conceptual developments have been of particular importance to our current life style. ''Knows,'' so, means that some passive entity, which may or may not be an existentiality, ''acquires notices'' or ''gets informed.'' Yet this Peripatetic-derived metabolic conception of knowledge, despite its soundness and worth for specific uses, leaves aside what precisely matters for understanding knowledge in both ontic and existential terms. This relinquishing squares with the conflation of nonempsyched organisms and circumstanced existentialities in the Peripatetic concept of sensitive soul.

In fact, when nonempsyched realities ''acquire notices'' or ''get informed'' there is shaping, or conformational action, but not gnoseological apprehension. In contrast, the acts of knowledge elicited by circumstanced existentialities, or gnoseological apprehension found in nature, apply onto the reactive intonation and unintonated proportioning of these very circumstanced existentialities. Gnoseological apprehension can operate—that is, can intellectually get the change in mental contents, without using the operatory understanding—an avenue that yields the ''nude'' intonation. Yet there are others. The differentiations or mental contents of all the circumstanced existentialities are made up of structureless elements coming from this sensational intonation, plus structural elements coming from the gnoseological apprehension and intrinsic

observability of one's efficient actions in context or from the neurobiological distribution that brings the said sensational intonations about. Thereby semovient observers who distinguish, among a diversity of previously met structureless variations, such a structureless reactive intonation of themselves and its structure-generating boundaries, may developmentally learn to recognize and directly intend the extramentalities whose interaction causally efficiently enacts a particular set of those intonations.

To barely hint a key point: this application of the knowing act can take place because time does course for structurally reacting causal exchanges but does not course for structurelessly reacting ones. The causal exchanges yielding structural reactions, say the collisions and relocation of sand grains under a blowing wind, transform things in extramental dispersivity; such causal exchanges do this by spatially translocating or reshaping things (i.e., reshaping situations or reshaping these things) as the previous state of affairs loses all actuality because the discrete carriers of causal action become such effect themselves. The resulting state of affairs, so, still keeps causal efficiency to nomically continue the causal series. Instead the causal exchanges yielding structureless reactions intonate existentialities. These causal exchanges modify the structureless intonations in existentialities who differentiate those intonations and whose sequences of modifications do not lose actuality, a state of affairs that does not keep any causal efficiency to continue a causal series. As empirically found, therefore, the sensible gnoseological apprehension—that is, the act of knowing what is sensed, or sensory noetic act—is thus the feature of efficiently causal interactions whereby the enacted structureless reactions intonate the reacting entity on ranges whose manifestation exhausts the causal efficiency. And the non-sensible or intellectual gnoseological apprehension is ontically the same with the sole difference that no specific intonation gets made to phenomenize.

Assuming a Plausible Understanding of Causation, How Can Privately Accessible Mental Events Cause or be Caused by Nonprivately Accessible Physical Events?

This question is the causal relationship's one, the issue that bears on the interaction between mental and physical events. ''Physical'' in this corny dichotomy should only mean everything whose causal courses run on discreteness of efficient action, a feature not expressed by the term ''mental.'' Yet it is not difficult to see how mental events, despite their being unlocated and often unformable (shapeless) in the space of the laboratory as well as lacking in size and mass, could nonetheless cause or be caused by extramentally spatial physical events located and possessed with mass energy. How can they interact? A short answer is: not through their ontological condition, but through their ontic consistency—which phenomenisms are steadfastly purposed to snub. Let me spell it out here.

Privately accessibility or lack of it are unrelated with the performance of this causal process. More to the point, observation shows extramental space's derivativeness. It is

observed in the formation of new space in preexisting extensions of older space, a process now thought to occur everywhere, as well between galaxies as inside our brain and body—themselves more than 99.999999999 percent empty space. The basic physical determinations that generate space appear as unlocalizable and, as a rule, the origin of actions results unlocalizable in space: as well for extramental changes coming from minds as for those coming from any physical field. No source of efficient causality is confinable to a spatial location. These determinations not even run on discreteness of efficient action, so that in the present state of the science one must say that the eclosion of every physical subparticle is not physical itself, at least if one wishes to keep in the sentence the same meaning for both uses of ''physical''; a related point is familiar in big-bang discussions. (Big bang, a key concept in cosmological theories that aspire to model the astrophysical evolution and detected expansion of the observable universe, is a swift outflow of all its material—unpacking it from a teensy, physically minimal dot of the heaviest, physically maximal density and largest energy—that while evolving generates space and so provides itself with the room to bloat.) What minds do, in establishing the local potentials of the field whose carriers minds utilize as the first causal link for triggering the sequence of nomic extramental effects, is the same that fields do when from an unlocalizable set of determinations they make themselves or another segregated field to eclose more, or either less, of its force carriers at every spot of volume, thereby changing the spatial distribution of their local potential.

In this way all interactions occur. Therefore, mind-brain interaction is by no means more thorny or problematic than the field generation of variations in local potentials; the latter simply is still less well known in brain-mind studies. And the reverse process, not yet more familiar in physics studies, is also illustratively observed in the said brain-mind research: as commented above, extramental causal efficiency is found to work out in psychisms just intonative reactions, not causing psychisms—whose sole operative presence is spatially localized—to be affected in such a way as to instrumentally transmit the extramental efficiency with mechanical effects. As an aftermath, the space localization of minds (not of their local causal exchange with extramentality—that is, the places of termination where the minds' causal action inheres in extramentality, presence of her immediate operation, or operative presence; but, of their ontic consistency) as well as the space localization of the field determinations that cause every virtual or real elementary particle to materialize where it in fact ecloses, is inexistent. Both of them occur foregoing the conditions that make space eventuate. The really problematical issue is why a mind ecloses to sense and move her brain rather than another.

What Is Restored on Recovery from Ordinary Sleep, Hibernation, General Anesthesia, ''Absence,'' Fainting, Comas, or Vegetative States?

A pair of essential components of every mind cannot be supplied by the brain that becomes hers (rather than availing, instead, to another person). Namely, for every sub-

jective existence, psyche, or personal existentiality found in nature, her ontic consistency and her cadacualtez (defined hereafter) cannot be provided by the brain itself or by its functioning.

Her ontic consistency, that is every mind's semovient-sensing makeup, is the extramental actuality availed by each personal existence. This extramental actuality is also availed by her intramentality which—finite minds being plural and their respective actions being kept mutually apart by extramentalities—never relinquishes its extramental condition and could never exhaust itself in sheer appearing or phenomenicity (as, in contrast, phenomenisms assert, true to their onticity-emptying belief that minds and mental contents are, by definition, only and no more than subjective).

In turn, her cadacualtez manifests itself as the constitutive determination of each finite mind to both causally affect and be causally affected by no other parcel of nature—namely, such and such a brain and its bodily and outer circumstances—than the parcel that, because of this determination, acquired the status that is called ''her.'' It prevents pronouncing minds ''productive creations'' whether of the mere complexity (hodologies) or the mere simplicity (immateriality). The bodily dispositions that enable her body to stay empsyched by a mind (aliveness), or prevent it (death), cannot discriminate between existentialities. Yet the neurodynamical patterns arising from anatomofunctional complexity, supplied by differential recruitment of elementary (molecular) neurobiological mechanisms, when they get eventually transduced into potentials of the immediately reactionable-to field, do not indiscriminately enter experience.

They do not do it except if they belong with the brain organ that the experience of the case is circumstanced to, whose actions in turn work on no other organ to start extramental causal chains. It it thus apparent that, even apart from (i.e., not counting, and refraining from considering) the nomic causal interactions involving body as well as mind, which consistently vary the elements composing their successive states, minds are in no way unrelated to their respective bodies. In fact, sustaining this relationship, rather than enacting some executable/forbearable operation involving psychosomatic concourse, is the primary act of every body that might be empsyched (see Ávila and Crocco 1996). In other words, cadacualtez is one's determination as not-another enabling one to sustain constitutive causal exchanges with a fixed parcel of nature, rather than one's existentiality having, instead, eclosed to any other constitutive brain or circumstance. Its observation shows that everything is not made of the same set of truly elementary components, as a giant meccano.

In the outlined context, all these particulars afford important insights for clinical practice. They are especially notable in regard to one of the central issues in the neurobiology of the (so-called) impaired consciousness. There, the outlined factual landscape is not consistent with the envisaged strategy of ''activating engrams.''

But engrams are an ideological fact, not a scientific fact. Such engrams are notional creatures, belonging in the Æschylus-Plato fantastic view of memories as extramental

sources of mental retention. On account of engrams, the causal continuity of two facts of an individual's experience, namely any original experience and its later remembering, is attributed to an intervention external to the experience so as to elude recognizing, to the individuals' experience, efficient causal aptitude to operate by itself, specially in time. Engrams are thus ''bodily impressions'' envisioned as tagged extramental settings of mental data, stored out of the mind—a nonsemovient mind whose ontology, thanks to the engrams's purifying role, remains unspoiled with sensual and contingent experiences.

Engrams are variably imagined, as complete material traces to realistically reproduce the original experience, for example by Plato, or as fragmentary functional ones to reconstruct it, if somehow confusely. The latter is the case of, for instance, Descartes (1596–1650) and Malebranche (1638–1715), who viewed memories as patterned motions of animal spirits through brain pores, later reenacted though running the risk of mutual interference. Engrams, however, are always impersonal and intrinsically unrelated to one's developmentally acquired systems of equilibrable semovient operations.

These engrams sketched and resketched on the brain do not exist. It does not matter if their nonexistence flabbergasts some neuroscientists in cultures whose science, commonsense, and language expressions assumed their reality for at least three millennia. Engrams are a purely fictional concept. It is conclusively shown by the amnesiacs' recuperations, which are incompatible with a ''data-losing-and-recovering'' naive construal of autobiographical memories as foreign to one's particular set of choices for equilibrable semovient operations.

Engrams not even could exist, since memories (rather than the nonmemorizable series of extramental events, whose causation is too tight to be usefully memorized) acquire their ''coarse graining,'' and on it their forms recognizable in terms of one's possible operations, from the dilation of the (otherwise unresolvable) sequence of their causal making. This sequence is stretched by the very relativistic transframing that provides biologically adaptive acuity to the depiction of their episodes. Only in this way can episodic and praxical memories be availed in minds' ontology, namely in the ontic consistency or extramental actuality of each personal existence. Rememberings cannot linger in the brain ''stored'' as ''data,'' namely in the condition in which their episodes occurred before their sequence was transframed, because their transframing is unrepeatable: it occurs as each segment of a biographical sequence comes about, and thus takes place just on one occasion for each remembered episode.

Memories or rememberings thus differ from and contrast with their mnesic reimagination, an ability to reconstruct them as cerebrally provided present sensations and, so, profit by their modifiability and ensuing capability of generating new experiences, in turn memorizable. (Mnesic reimaginations also differ from every other new sensation in that their apperception preexists rather than follows their arrival on the scene.)

This ability, like flying and deep diving, was probably selected on Earth a number of times—although it took a paleontologically recent part in the natural selection of the psychological governance of cerebral performance.

Such a brain-depending ability—*mente fingere per cerebrum*—makes a significant contrast with memories. While the preservation of memories is an effect of the absence of time course, their modifiable reimagining exploits the presence of brain structures. Thus this issue of ''impaired consciousness,'' for clinical practice, amounts to controlling the tissue's electroneurobiological activity that gates the proper acuity, so ''coupling'' or ''switching on'' the body in order to ''awaken'' the finite psyche who—on other grounds—remains incumbent rather than any other.

Notes

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References

Ávila, Alicia, and Mario Crocco (1996), *Sensing: A New Fundamental Action of Nature* (Folia Neurobiológica Argentina, Vol. X), Buenos Aires: Institute for Advanced Study.

Congedo, Marco, J. F. Lubar, and D. Joffe (2004), ''Low-Resolution Electromagnetic Tomography Neurofeedback,'' *IEEE Transactions on Neuronal Systems & Rehabilitation Engineering*, Vol. 12, No. 4, pp. 387–397.

Crocco, Mario (1963), ''La cilia de las neuronas centrales, reliquia del tronco común de motilidad y percepción,'' poster, Escuela Normal de Profesores Nro. 2 Mariano Acosta, Bs. Aires.

——— (1971), ''Filogénesis de los mecanismos intraencefálicos de posicionamiento objetal,'' communication to the Asociación Argentina para el Progreso de las Ciencias (pr. D. Goytía, August) and the National Council of Scientific & Technical lnvestigations, Presidency of the Nation, Argentine Republic (February 1972).

De Vera, Luis, Ernesto Pereda, Alejandro Santana, and Julián González (2005), ''Time-Related Interdependence between Low-Frequency Cortical Electrical Activity and Respiratory Activity in Lizard, *Gallotia galloti*,'' *Journal of Experimental Zoology*, Vol. 303A, pp. 217–226.

Egner, T., T. F. Zech, and J. H. Gruzelier (2004), ''The Effects of Neurofeedback Training on the Spectral Topography of the Electroencephalogram,'' *Clinical Neurophysiology*, Vol. 115, No. 11, pp. 2452–2460.

Hinterberger, Thilo, Gerold Baier, Jürgen Mellinger, and Niels Birbaumer (2004), ''Auditory Feedback of Human EEG for Direct Brain-Computer Communication,'' *Proceedings of ICAD 04-Tenth Meeting of the International Conference on Auditory Display*, Sydney, Australia: http://www.icad.org/websiteV2.0/Conferences/ICAD2004/papers/hinterberger_etal.pdf.

Kubler, A., F. Nijboer, J. Mellinger, T. M. Vaughan, H. Pawelzik, G. Schalk, Dennis J. McFarland, Niels Birbaumer, and Jonathan R. Wolpaw (2005), ''Patients with ALS [amyotrophic lateral sclerosis] Can Use Sensorimotor Rhythms to Operate a Brain-Computer Interface,'' *Neurology*, Vol. 64, No. 10, pp. 1775–1777.

Leeb, R., R. Scherer, C. Keinrath, C. Guger, and Gert Pfurtscheller (2005), ''Exploring Virtual Environments with an EEG-Based BCI [brain-computer interface] Through Motor Imagery,'' *Biomed. Tech. (Berlin)*, Vol. 50, No. 4, pp. 86–91.

Mukhametov, L. M. (1984), ''Sleep in Marine Mammals,'' in A. A. Borbely and J. L. Valatx, eds., *Sleep Mechanisms* (Experimental Brain Research Suppl. 8), pp. 227–236, Heidelberg: Springer Verlag.

Muller-Putz, G. R., R. Scherer, Gert Pfurtscheller, and R. Rupp (2005), ''EEG-Based Neuroprosthesis Control: A Step towards Clinical Practice,'' *Neuroscience Letters*, Vol. 382, Nos. 1–2, pp. 169–174.

Patterson, W. R., Y. K. Song, C. W. Bull, I. Ozden, A. P. Deangellis, C. Lay, J. L. McKay, A. V. Nurmikko, J. D. Donoghue, and B. W. Connors (2004), ''A Microelectrode/Microelectronic Hybrid Device for Brain Implantable Neuroprosthesis Applications,'' *IEEE Transactions in Biomedical Engineering*, Vol. 51, No. 10, pp. 1845–1853.

Santana, Daniel, Ramírez Flores, Maura Jazmín Ostrosky, and Feggy Solís (2004), ''Novedades en tecnología de rehabilitación: una revisión acerca de la interfaz cerebro-computadora,'' *Revista de Neurología*, Vol. 39, No. 5, pp. 447–450, http://www.revneurol.com/download.asp?document=2004117.

Triarhou, Lazarus C., and Manuel del Cerro (2006a), ''Semicentennial Tribute to the Ingenious Neurobiologist Christfried Jakob (1866–1956)—1: Works from Germany and the First Argentina Period, 1891–1913,'' *European Neurology*, Vol. 56, pp. 176–188.

——— (2006b), ''Semicentennial Tribute to the Ingenious Neurobiologist Christfried Jakob (1866–1956)—2: Publications from the Second Argentina Period, 1913–1949,'' *European Neurology*, Vol. 56, pp. 189–198.

Weiler, Elmar W. J., Klaus Brill, Ken H. Tachiki, and Dieter Schneider (2002), ''Neurofeedback and Quantitative Electroencephalography,'' International Tinnitus Journal, Vol. 8, No. 2, pp. 87–93. Also at: http://www.neurootology.org/show/?pid=czoyOiI0NyI7.

Weiskopf, Nikolaus, Klaus Mathiak, Simon W. Bock, Frank Scharnowski, Ralf Veit, Wolfgang Grodd, Rainer Goebel, and Niels Birbaumer (2004), ''Principles of a Brain-Computer Interface

(BCI) Based on Real-Time Functional Magnetic Resonance Imaging (fMRI),'' *IEEE Transactions in Biomedical Engineering*, Vol. 51, No. 6, pp. 966–970, http://njc.berkeley.edu/Papers/Weiskopf_BCI.pdf.

Wolpaw, Jonathan R., and Dennis J. McFarland (2004), ''Control of a Two-Dimensional Movement Signal by a Noninvasive Brain-Computer Interface in Humans,'' *Proceedings of the National Academy of Sciences U. S. A.*, Vol. 101, No. 51, pp. 17849–17854.

Yamawaki, Nobuyuki, C. Wilke, Z. M. Liu, and B. He (2005), ''An Improvement of a Time-Frequency Approach for an EEG-Based Brain-Computer Interface,'' *Intl. Journal of Bioelectromagnetism*, Vol. 7, No. 1, pp. 289–291.

Yoo, S. S., T. Fairneny, N. K. Chen, S. E. Choo, L. P. Panych, H. Park, S. Y. Lee, and F. A. Jolesz (2004), ''Brain-Computer Interface Using fMRI: Spatial Navigation by Thoughts,'' *Neuroreport*, Vol. 15, No. 10, pp. 1591–1595.

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